June 19, 2000

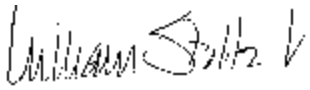
David P. Boergers
Office of the Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, D.C. 20426

RE: ESA (Endangered Species Act) Section 7 Biological Opinion on the Interim Protection Plan for Operation of the Wells Hydroelectric Project (FERC Project Number 2149) [Consultation Number F/NWR/2000/00423]

Dear Mr. Boergers:

Enclosed please find the NMFS (National Marine Fisheries Service) Biological Opinion for operation of the Wells Hydroelectric Project pursuant to the March 1998, and August 1999, listings of Upper Columbia River spring chinook salmon and summer steelhead, respectively, as endangered, and the March 1999, listing of Middle Columbia River steelhead as threatened. As stated in the Biological Opinion, NMFS has determined that the proposed action is not likely to jeopardize the continued existence of these species and is not likely to result in the destruction or adverse modification of critical habitat.

Sincerely,



William Stelle, Jr.
Regional Administrator

Enclosure

cc: Bill Yallup, Yakima Indian Nation
Olney Patt, Confederated Tribes of the Warm Springs Reservation of Oregon
Samuel Penney, Nez Perce Tribe
Antone Minthorn, Confederated Tribes of the Umatilla Indian Reservation
Donald Sampson, Columbia River Inter-Tribal Fish Commission
Joseph Pakootas, Confederated Tribes of the Colville Reservation
Bruce Wynne, Spokane Tribe of Indians
Brian Cates, USFWS Mid Col RFRO
Bob Heinith, CRITFC

continued:

Rick Klinge, Douglas County PUD
Shane Bickford, Douglas County PUD
Tom Lorz, CRITFC
Cary Feldmann, Puget Power Company
Rod Woodin, WA Dept of Fisheries
Dennis Rohr
Jerry Marco, Colville Conf Tribes
Larry Brown, WA Dept of Fish and Wildlife
Bill Hevlin, NMFS
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Jim Hastreiter, FERC
Merrill Hathaway, FERC
Bryan Nordland, NMFS
Paul Ward, Yakima Nation Fisheries
Steve Parker, Yakima Nation Fisheries
Stuart Hammond, Grant County PUD
Malcolm Mclellan, Attorney at Law
Ron Boyce, OR Dept. of Fish and Wildlife
Robert McDonald, Chelan Co PUD
Chuck Peven, Chelan Co PUD
Randy Settler, Yakama Indian Nation
Tim Weaver, Cockrill and Weaver, P.S.
Carl Merkle, Confederated Tribes of the Umatilla Reservation
Tim Brewer, Confederated Tribes of the Colville Reservation

Endangered Species Act - Section 7
Consultation

BIOLOGICAL OPINION

Interim Protection Plan
for Operation of the Wells Hydroelectric Project
(FERC Project Number 2149)

Agencies: Federal Energy Regulatory Commission
National Marine Fisheries Service

Consultation Conducted by: National Marine Fisheries Service,
Northwest Region

Date Issued: June 19, 2000

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1. OBJECTIVES

This Biological Opinion presents NMFS' (National Marine Fisheries Service) conclusions resulting from consultation pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) and implementing regulations found at 50 CFR Part 402. It addresses the effects of the continued operation of the Wells Hydroelectric Project, licensed by the Federal Energy Regulatory Commission (FERC), on three species of salmon listed as either threatened or endangered. Upper Columbia River steelhead (Oncorhynchus mykiss) and Upper Columbia River spring-run chinook salmon (O. tshawytscha), listed as endangered, and Middle Columbia River steelhead (O. mykiss), listed as threatened, are all under NMFS jurisdiction. Critical habitat was designated on March 17, 2000 (50 CFR Part 226). The designation of critical habitat provides notice to Federal agencies that these areas and features are vital to the conservation of listed UCR (Upper Columbia River) salmon and steelhead.

The primary objective of this Biological Opinion is to determine whether the continued operation of the Wells Hydroelectric Project, as proposed by the Public Utility District No. 1 of Douglas County through April 1, 2002, is likely to jeopardize the continued existence of UCR steelhead, UCR spring-run chinook salmon, and MCR (Middle Columbia River) steelhead[1]. A HCP (Habitat Conservation Plan) developed by the Douglas County PUD (Public Utility District) may supersede this action in 2002, following resolution of remaining issues, environmental review, and ESA Section 10(a)(1)(b) compliance (which will include a separate consultation under ESA Section 7(a)(2)). Elements of the proposed actions that pertain to hatchery compensation have either been previously addressed or will be addressed in separate biological opinions and corresponding Section 10 permits.

2. BACKGROUND (Consultation History)

In August 1997, NMFS listed UCR steelhead as endangered under the ESA. On October 9, 1997, the Douglas County PUD petitioned FERC for approval of an IPP (Interim Protection Plan) for UCR steelhead at the Wells Hydroelectric Project. The IPP describes interim fish protection measures intended to reduce the effects of project operations on UCR steelhead. It was developed to govern project operations until the HCP agreement could be ratified through the required environmental and ESA processes. In November 1997, FERC designated the PUD a non-Federal representative for the purpose of developing a draft biological assessment on the effects of the proposed IPP for UCR steelhead. The PUD submitted this draft biological assessment to FERC in February 1998.

In a March 26, 1998 letter to NMFS, FERC requested consultation over the effects of the IPP on UCR steelhead. Due to the recent listing of UCR spring-run chinook salmon as endangered (March

[1]FERC in its capacity as a regulatory agency and through its licensing authorities under the FPA (Federal Power Act) will consider for approval the actions proposed by the licensee.

1998), FERC also requested conferencing for UCR spring-run chinook. A final biological assessment of the Wells Project IPP was attached. Implementation of the proposed action was to continue from 1998 until the HCP was implemented or until December 31, 2000, at which time the provisions of the IPP would remain in effect subject to review and amendment through reinitiation of consultation. The FERC concluded that the actions described in the IPP were *not likely to adversely affect* UCR steelhead and *not likely to jeopardize* UCR spring-run chinook.

In a July 14, 1998 letter to FERC, NMFS did not concur with FERC's conclusion that the IPP was not likely to adversely affect UCR steelhead. In addition, because the biological assessments attached to the March 26, 1998, request for consultation did not address UCR spring-run chinook salmon, NMFS could not evaluate the basis of FERC's *not likely to jeopardize* conclusion for that species. The NMFS stated that formal consultation would be required to evaluate the effects of the IPP on both UCR spring-run chinook salmon and steelhead. The NMFS also requested that the modified proposed action include the development of a QAR (quantitative analytical report) specifying biological requirements for survival and recovery of ESA listed species, and a steelhead adult passage survival study. Additional discussions between NMFS, the Douglas County PUD, and FERC resulted in modifications to the proposed actions and the analyses of those actions in biological assessments.

On April 2, 1999, the PUD provided NMFS with a draft biological assessment evaluating the effects of the Wells Hydroelectric Project IPP on UCR spring-run chinook salmon. This new biological assessment included juvenile and adult fish passage plans, a predator removal plan, and monitoring and research plans. This additional information applied to both UCR spring-run chinook salmon and UCR steelhead. NMFS considers formal consultation with FERC on the Wells Hydroelectric Project to have been initiated on April 2, 1999, following receipt by NMFS of all the information (at least in draft form) necessary to conduct this consultation, as described in 50 CFR 402.14(c).

Based on this information, and information provided by the PUD No.1 of Chelan County for the Rocky Reach and Rock Island projects and by the PUD No. 2 of Grant County for the Priest Rapids and Wanapum dams, NMFS produced a pre-decisional review draft Biological Opinion on August 26, 1999. The review draft Biological Opinion consolidated the information and proposed actions from all five FERC-licensed hydroelectric projects on the Mid-Columbia River (Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams). The NMFS elected to coordinate consultations on each of the separate FERC actions in an attempt to streamline the consultation process while enabling a quantitative assessment of the cumulative effects associated with all five dams. Consultation meetings were then held with all of the PUDs (Douglas County, Chelan County, and Grant County) and FERC non decisional staff on September 9, 1999, and on October 5, 1999, and with FERC and the Douglas and Chelan county PUDs on September 17, 1999. Additional technical consultations were held with the Grant County PUD on October 15, 1999.

Many of the initial concerns expressed by the PUDs were addressed during these consultation meetings and during informal discussions over the following two months. Several issues pertaining to the HCP

agreements proposed by the Douglas and Chelan county PUDs, however, continued to complicate the coordinated consultation process. Therefore, on January 20, 2000, NMFS elected to separate the FERC actions back into independent consultations. As a result, this Biological Opinion was completed specifically for the Wells Hydroelectric Project.

On April 17, 2000, a draft version of this Biological Opinion was distributed for comment to members of the Mid-Columbia Coordinating Committee and to the Confederated Tribes of the Umatilla Indian Reservation, the Spokane Tribe of Indians, the Confederated Tribes of the Colville Reservation, the Yakima Indian nation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Nez Perce Tribe, and CRITFC (Columbia River Inter-Tribal Fish Commission). Comments were received from CRITFC on May 12, 2000, and necessary modifications were incorporated into this Biological Opinion.

3. PROPOSED ACTIONS

The actions analyzed in this Biological Opinion include proposals by FERC to permit the continued operation of the Wells Hydroelectric Project and to continue implementation of a predator removal and harassment program through April 1, 2002. During this interim period, the survival levels necessary to recover listed species will be better defined and the resulting information will be used to develop and analyze the long-term fish protection measures proposed in the HCP for the Wells Hydroelectric Project. These interim operations are analyzed in Section 6.

3.1 Primary Purpose of the Proposed Actions

The purpose of the FERC proposed action is to accomplish the objectives in the FPA. Operations proposed at the Wells Hydroelectric Project are described in the IPP which consists of the existing license and settlement agreement, annual fish passage plans, biological assessments, and letters received from FERC and the PUD. The IPP and the terms and conditions of this Biological Opinion will be the basis for project license modifications issued by FERC.

Pursuant to the FPA and the U.S. Department of Energy Organization Act, FERC is authorized to issue licenses governing the construction and operation of Non-Federal hydroelectric projects for terms of up to 50 years. The license issued to the Douglas County PUD for operation of the Wells Hydroelectric Project (FERC Project Number 2149) expires in 2012. In 1979, many Federal and State resource agencies and Indian Tribes petitioned FERC to protect anadromous fish migrating through project facilities. In 1990, an offer of settlement was filed with FERC and the existing license was modified to include specific criteria for operating the juvenile and adult passage facilities and to include a hatchery program. The settlement agreement also provided for continued studies and evaluations of the program

and established the Wells Coordinating Committee[2] which oversees implementation of the agreement. The FERC maintained its authority to require changes in structures and project operations should the need arise.

The proposed actions also include the development of a long-term operational plan for the Wells Hydroelectric Project (HCP for the Wells Hydroelectric Project). The PUD, will assist NMFS in developing an analysis of the HCP in a time frame for review and final action by April 1, 2002. In addition, the proposed actions include research to assist in the development and evaluation of the HCP, and hatchery and tributary enhancement funding as compensation activities to mitigate some adverse project effects (evaluated in separate consultations).

3.2 Actions Proposed to Protect, Mitigate, and Enhance Affected Species

Although both the juvenile and adult life stages of listed species are affected by the proposed actions, factors affecting juvenile survival comprise the principal mitigative measures proposed in the IPP. At the Wells Hydroelectric Project, these measures include operation of the surface bypass system, operation of the turbine units at maximum efficiency during the juvenile fish passage season and implementation of a predator removal and harassment program. The surface bypass system will utilize up to 8% instantaneous total river flow, 24 hours a day to encompass at least 95% of the juvenile steelhead and yearling chinook salmon migrations. The PUD also proposes to operate and maintain each of the existing adult fishways and to implement additional actions where practicable to help reduce injuries due to fallback. Detailed operations of the fish passage systems are described in the WFPP (Wells Fish Passage Plan).

There are no specific measures proposed to either evaluate adult survival through the project or to evaluate spawning success. The PUD has, however, proposed to assist in developing the methodologies necessary to conduct these studies.

3.2.1 IPP (Interim Protection Plan)

The proposed operations at the Wells Hydroelectric Project are described in the IPP *(Biological Assessment of the Wells Hydroelectric Project Interim Protection Plan for Upper Columbia River Steelhead)* submitted to NMFS by FERC on March 26, 1998, and a draft *Biological Assessment of the Wells Hydroelectric Project Interim Protection Plan for Upper Columbia River Spring Chinook* submitted to NMFS by the Douglas County PUD on April 2, 1999. The April 2, 1999 draft biological assessment included both adult and juvenile fish passage measures, predator control measures, monitoring and evaluation measures, and hatchery measures. The following is a summary of the proposed actions (additional details of these proposed actions can be found in the

[2]NMFS will continue to utilize the Wells Coordinating Committee, soliciting input for all major decisions regarding actions contained in this Biological Opinion.

WFPP and related documents).

3.2.1.1 Adult Fish Passage Measures

- Operation and maintenance of the fishways according to criteria in the WFPP.
- Investigate entrance and ladder modifications to improve operation of the ladders within specified criteria, and to minimize delay.
- Conduct appropriate evaluations to determine the best actions for correcting delay problems in the junction pool area of the fishladders.
- If adult passage problems are identified the PUD will develop solutions and implement corrective actions.
- The juvenile surface bypass system will be operated from April through August during which time the majority of the adult salmonid passage occurs, providing a fallback and downstream passage route through the dam.
- Evaluate steelhead passage using radio-telemetry.

3.2.1.2 Juvenile Fish Passage Measures

- Turbine Operations - Operate turbines at peak efficiency to the extent practicable during the fish passage season.
- Surface Bypass Operation - Operate the surface bypass system 24 hours a day according to the criteria specified in the WFPP to encompass 95% of the downstream migrations of juvenile spring-run chinook salmon and steelhead. The Wells Coordinating Committee bypass team will determine the dates of operation by utilizing monitoring information from hydroacoustic transducers installed in the forebay of the Wells Hydroelectric Project.
- Routine Maintenance - The PUD will not plan or conduct routine maintenance on turbine units or spillway gates that will effect fish passage, survival, or water quality parameters during the fish migration periods. If emergency maintenance of turbine units or spillway gates is required, the PUD will minimize the outage to the extent practicable and report the incidence, and the measures taken to prevent future outages, to NMFS as soon as possible.

3.2.1.3 Predator Control Measures

- Continue to refine and implement a comprehensive predator removal and harassment program. Activities include a Northern pikeminnow bounty program and sport fishing derby. In addition, the PUD is proposing to harass and remove predatory birds and to maintain steel wires over the Wells Hydroelectric Project tailrace.

3.2.1.4 Monitoring and Evaluation Measures

The Douglas County PUD has submitted research and monitoring plans in the IPP for 2000 and proposes to update these plans for NMFS' annual approval. The specific proposals are contained in the WFPP and are found in the following appendices to the March, 1999, UCR spring-run chinook salmon biological assessment: Appendix A - Juvenile Fish Passage Plan, Appendix B - Juvenile Fish Monitoring Plan, Appendix C - Adult Fish Passage Plan, Appendix D - Fish Ladder Passage Evaluation Plan, Appendix E - Total Dissolved Gas Monitoring Plan, Appendix F - Predator Removal and Harassment Plan, and Appendix G - Smolt Survival Study Plan. Generally, these measures include:

- Juvenile Run Timing - Run timing is determined by a real-time index of salmonids based upon hydroacoustic data and verified by fyke net data. Fyke net sampling will be conducted annually from March 15 through April 10, and from August 15 through August 30. Initiation of bypass system operations is determined by a subgroup of the Wells Coordinating Committee in consultation with NMFS.
- Juvenile Survival - The PUD, with NMFS participation and approval, will develop and utilize the best techniques to estimate the survival of juvenile steelhead and spring-run chinook salmon through the project. Techniques may include the use of radio-telemetry or tag, release, and recapture methodologies. The specific methodology will be developed through consultation with NMFS and the Wells Coordinating Committee.
- Adult Survival - The PUD proposes to maintain project fishways and correct problems where noted to minimize potential prespawning mortality associated with the Wells Hydroelectric Project (discussed above). In addition, the PUD will work with NMFS and the Wells Coordinating Committee to develop the methodologies necessary to assess adult survival.
- Total Dissolved Gas (TDG) Monitoring - The PUD will provide physical monitoring of TDG levels and temperature at fixed location monitors located in the forebay and downstream of the dam. The PUD will also provide biological monitoring to determine the incidence of Gas Bubble Disease (GBD) symptoms in adult steelhead and spring-run chinook salmon that are handled under existing trapping operations.
- Fish Counting - The PUD will provide adult fish counts on a 24 hour basis.

3.2.1.5 Hatchery Measures

The IPP proposed actions include:

- Continuation of current hatchery compensation programs for UCR spring-run chinook salmon at the Methow Fish Hatchery.
- Current UCR steelhead hatchery compensation programs at Wells Hatchery and off-site acclimation facilities.

These hatchery measures are listed here for completeness; however, they are not included within the scope of this Biological Opinion. ESA Consultation regarding operation of the Wells Hatchery for the

UCR steelhead program was completed on February 4, 1998, and Section 10 permit #1094 was issued to the WDFW (Washington Dept. of Fish and Wildlife). ESA Consultation regarding operation of the Methow Fish Hatchery for the UCR spring-run chinook salmon program is currently being considered under the review of Section 10 permit #1196 issued to the WDFW and NMFS is preparing a biological opinion regarding issuance of that permit.

The PUD proposes to continue the compensation and supplementation programs as designated in the Wells Settlement Agreement. In addition, they will fund changes in hatchery procedures and the evaluations necessary to make Douglas County PUD's hatchery compensation program consistent with the recovery of spring-run chinook salmon and steelhead populations, as defined in the proposed HCP's biological assessment and Management Plan: Mid-Columbia River Hatchery Program.

3.2.2 Development of Long-Term Operating Plans

A component of the proposed action is to develop and implement a long-term protection plan for listed salmonids at the Wells Hydroelectric Project. The long-term plan will include survival standards that have been evaluated through an analytical process and will include a collaborative process for making determinations on necessary measures. The proposed HCP for the Wells Hydroelectric Project represents the Douglas County PUD long-term protection plan. The proposed HCP includes a commitment to no net impact on anadromous salmonids as a result of project operations and incorporates an adaptive management approach that allows operations to be modified as additional information becomes available. Due to the uncertainty in the existing information base, it is important that the proposed HCP be completed as soon as possible, at least prior to April 1, 2002. Extending the uncertainty beyond this date will result in an unacceptable level of risk to listed species requiring reinitiation of consultation (Section 11).

The Douglas County PUD has submitted the Wells Hydroelectric Project HCP to NMFS for an ESA Section 10 Incidental Take Permit. Issuance of the Incidental Take Permit constitutes a Federal Action that must go through a NEPA (National Environmental Policy Act) review that will include the development of an EIS (Environmental Impact Statement), and completion of an ESA section 7(a)(2) consultation. The Douglas County PUD will support completion of the EIS and any other analyses needed for authorization of the HCP by FERC and NMFS, within a time frame that will result in implementation by April 1, 2002. Specifically, the EIS is proposed to be completed by June, 2001, with any required FERC actions completed by April 1, 2002.

3.2.2.1 QAR (Quantitative Analytical Report)

At NMFS' request, the PUD is participating in, and funding (along with the Bonneville Power Administration, Corps of Engineers, and Bureau of Reclamation), a comprehensive analysis of the proposed HCP actions on the biological requirements of UCR spring-run chinook salmon and steelhead. The report will estimate the likelihood that the combined effects of the proposed long-term

measures at the PUD and Federal dams and the proposed production and upstream habitat enhancement measures will lead to survival and recovery.

An outline of the elements and general approach to this analysis are described in an October 16, 1998, memorandum from B. Hevlin and C. Toole (NMFS) to the MCCC (Mid-Columbia Coordinating Committee) and in an April 5, 1999, memorandum from Toole and Hevlin to the MCCC and the Implementation Team. The draft analysis is still in review. Completion of the analysis will enable NMFS to evaluate the effects of the proposed HCP and will aid in finalizing the HCP measures and survival standards.

3.3 Duration of the Interim Operations

The measures identified in the IPP were intended by FERC and the PUD to remain in effect, subject to review and amendment after December 31, 2000, until the HCP is implemented. The HCP is currently scheduled for completion by June 2001, with all FERC required license modifications completed by April 1, 2002. Therefore, the conclusions reached in this Biological Opinion cover the time period through April 1, 2002.

4. BIOLOGICAL INFORMATION

ESU Descriptions, Life Histories, Current Range-Wide Status, and Factors for Decline.

4.1 UCR Spring-Run Chinook Salmon

The UCR spring-run chinook salmon ESU (evolutionarily significant unit) includes all progeny of naturally-spawning populations of stream-type (spring) chinook salmon in all river reaches above Rock Island Dam and downstream of Chief Joseph Dam, excluding the Okanogan River. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Chiwawa River (spring run); Methow River (spring run); Twisp River (spring run); Chewuch River (spring run); White River (spring run); and Nason Creek (spring run). Life history characteristics of UCR spring-run chinook salmon have been reviewed by Myers *et al*. (1998). The UCR spring-run chinook salmon ESU was listed by NMFS as endangered on March 24, 1999 (64 FR 14308).

Upper Columbia River spring-run chinook salmon have a stream-type life history. Adults return to the Wenatchee River during late March through early May, and to the Entiat and Methow rivers during late March through June. Most adults return after spending two years in the ocean, although 20% to 40% return after three years at sea. Like the Snake River spring/summer chinook, UCR spring-run chinook salmon are subject to very little ocean harvest. Peak spawning for all three populations occurs from August to September. Smolts typically spend one year in freshwater before migrating downstream. This ESU has slight genetic differences from other ESUs containing stream-type fish, but more importantly, ecological differences in spawning and rearing habitats were evident and were used to

define the ESU boundary (Myers *et al.* 1998). The Grand Coulee Fish Maintenance Project (1939 through 1943) may also have been a major influence on this ESU because fish from multiple populations were mixed into one relatively homogenous group and redistributed into streams throughout the Upper Columbia Region.

Three independent populations of spring-run chinook salmon are identified for the ESU including those that spawn in the Wenatchee, Entiat, and Methow river basins (McElhany *et al.* 1999). Trends for these populations have generally been declining. The NMFS recently proposed Interim Recovery Abundance Levels and Cautionary Levels (i.e, still under review and subject to change; see draft Quantitative Analytical Report). The Cautionary Levels are characterized as abundance levels below which, historically, the population would be expected to fall only about 10% of the time (i.e., determined from the lower end of the spawning abundances exhibited when the population was relatively healthy). Escapements in recent years, especially in 1995, have been consistently below these levels indicating increasing risk and uncertainty about population status. The primary return year for the 1995 brood was 1999 and preliminary return estimates indicate that although returns were low, they were still substantially higher than the brood year replacement levels. The very strong jack returns in 1999 suggest that survival rates for the 1996 brood will be high, as well, and 4,500 natural-origin UCR spring-run chinook salmon are expected to return to the mouth of the Columbia River during 2000. The corresponding expected return-to-subbasin for these populations, however, accounting for expected harvest, inter-dam loss, and prespawning mortality, is expected to be about equivalent to the Cautionary Levels.

As noted, six hatchery populations are included in this ESU; all six are considered essential for recovery and are included in the listing. Risks associated with artificial production programs within the ESU are a concern because of the use of non-native Carson stock for fishery enhancement and hydropower mitigation. However, programs have been initiated to develop locally-adapted brood stocks to supplement the natural populations in the ESU. The Carson stock is being phased out at those facilities where straying and natural stock interactions are problematic. Captive broodstock programs are under way in the Nason Creek and the White River (the Wenatchee basin) and in the Twisp River (Methow basin), to prevent those populations from going extinct. In some recent years, all spring-run chinook salmon have been trapped at the Wells Hydroelectric Project to begin a composite-stock broodstock supplementation program for the Methow Basin.

4.2 UCR Steelhead

The UCR steelhead ESU includes all progeny of naturally spawned populations of steelhead in the Columbia River Basin upstream from (excluding) the Yakima River, Washington, to the U.S.-Canada border. Steelhead (and their progeny) from Wells Hatchery stock are also considered part of the listed ESU. Life-history characteristics of UCR steelhead have been reviewed by Chapman *et al.* (1994b) and Busby *et al.* (1996). The NMFS listed the UCR steelhead ESU as endangered on August 18, 1997 (62 FR 43937).

The return of UCR natural-origin steelhead to Priest Rapids Dam declined from a 5-year average of 2,700 beginning in 1986 to a 5-year average of 900 beginning in 1994 (FPC 1998). The WDFW has set an escapement goal for natural-origin fish of 4,500. The hatchery component is relatively abundant and routinely exceeds the needs of the supplementation program by a substantial margin. Therefore, because of the unnecessary restrictions resulting from their listing, NMFS is currently considering delisting the hatchery component of the UCR steelhead ESU.

The naturally-spawning population of UCR steelhead has been augmented for a number of years by straying hatchery fish. Replacement ratios for naturally-spawning fish (natural-origin and hatchery strays) are quite low, on the order of 0.3. This very low return rate suggests that either hatchery strays are largely supporting the population, or that hatchery strays are not contributing substantially to subsequent adult returns and natural-origin fish are returning at or just below the replacement rate, or some intermediate combination of these factors. Given these uncertainties, efforts are underway to diversify broodstocks used for supplementation, minimizing the differences between hatchery and natural-origin fish as well as other concerns associated with supplementation. Assuming that the hatchery broodstock represents the listed ESU, NMFS expects that the early life history survival advantage of hatchery smolts will help stocks to rebuild. However, there are also substantive concerns about the long term effect on the fitness of natural-origin populations resulting from an ongoing, long term infusion of hatchery-influenced spawners (Busby *et al.* 1996).

4.3 MCR Steelhead

The MCR steelhead ESU includes all progeny of naturally-spawning steelhead in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River (RM 335), Washington. This ESU includes the only populations of winter inland steelhead in the United States (in the Klickitat River, Washington, and Fifteenmile Creek, Oregon, (Busby *et al.* 1996)). The NMFS listed the MCR steelhead ESU as threatened on March 25, 1999 (64 FR 14517).

Life history information for Middle Columbia River steelhead indicates that most smolt at two years of age and spend one to two years in salt water (i.e., 1-ocean and 2-ocean fish, respectively). After reentry, they may reside in freshwater up to a year before spawning (Howell *et al.* 1985). Within the ESU, the Klickitat River is unusual in that it produces both summer and winter steelhead and the summer steelhead are dominated by 2-ocean steelhead (most other rivers in this region produce about equal numbers of both 1-and 2-ocean steelhead).

Escapement to the Yakima, Umatilla, and Deschutes subbasins have shown overall upward trends, although all tributary counts in the Deschutes River are downward and the Yakima River is recovering from extremely low abundances in the early 1980s. The John Day River probably represents the largest native, natural spawning stock in the ESU, and the combined spawner surveys for the John Day

River have been declining at a rate of about 15% per year since 1985. However, estimates based on dam counts show an overall increase in steelhead abundance, with a relatively stable naturally-produced component. The NMFS, in proposing this ESU for listing as threatened under the ESA, cited low returns to the Yakima River, estimates of low abundance for Klickitat River and Fifteenmile Creek winter steelhead, and an overall decline for naturally-producing stocks within the ESU.

Hatchery fish are widespread and stray to spawn naturally throughout the region. Recent estimates of the proportion of natural spawners of hatchery origin range from low (Yakima, Walla Walla, and John Day rivers) to moderate (Umatilla and Deschutes rivers). Most hatchery production in this ESU is derived primarily from within-basin stocks. One recent area of concern is the increase in the number of Snake River hatchery (and possibly wild) steelhead that stray and spawn naturally within the Deschutes River Basin. Studies have been proposed to evaluate, hatchery programs within the Snake River Basin that have shown high rates of straying into the Deschutes River and to make needed changes to minimize straying to rivers within the Middle Columbia River steelhead ESU.

The ESU is in the intermontane region and includes some of the driest areas of the Pacific Northwest, generally receiving less than 40 cm of rainfall annually (Jackson 1993). Vegetation is of the shrub-steppe province, reflecting the dry climate and harsh temperature extremes. Factors contributing to the decline of Middle Columbia River steelhead include agricultural practices, especially grazing and water diversions/withdrawals. In addition, hydropower development has affected the ESU through loss of habitat above tributary hydro projects and through mortalities associated with migration through the Columbia River hydrosystem.

4.4 Species-Level Biological Requirements

Species-level biological requirements are best defined as the attributes associated with viable salmonid populations (NMFS 1999 [12/12/99 VSP draft]). Viable salmonid populations have a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame. The attributes associated with viable salmonid populations include: adequate abundance, productivity (population growth rate), population spatial scale, and diversity. These attributes are influenced by survival, behavior and experiences throughout the entire life cycle, and are therefore distinguished from the more specific biological requirements associated with the action area (described in Section 5) and the particular action under consultation. Species-level biological requirements are influenced by all actions affecting the species throughout its life cycle. It is important that the action-area biological requirements be considered in the context of these species-level biological requirements in order to evaluate the potential for the species to survive and recover given the comprehensive set of human activities and environmental conditions that are affecting it.

Most populations comprising listed species are not viable, by definition. Listed species will be

considered recovered[3] when, among other things, factors for decline have been ameliorated and when a sufficient number of populations within the ESU have become viable. For the purpose of assessing the effects of the proposed actions while listed ESUs and their component populations are moving towards recovery, NMFS has defined the degree to which species-level biological requirements must be met primarily in terms of abundance (NMFS 1995 [1995 FCRPS Biological Opinion]):

> "At the species level, NMFS considers that the biological requirements for survival, with an adequate potential for recovery, are met when there is a high likelihood that the species' population will remain above critical escapement thresholds over a sufficiently long period of time. Additionally, the species must have a moderate to high likelihood that its population will achieve its recovery level within an adequate period of time. The particular thresholds, recovery levels, and time periods must be selected depending upon the characteristics and circumstances of each salmon species under consultation."

This definition implicitly addresses the productivity criterion for viable populations because population growth rate must increase to reach critical threshold or recovery abundance levels from current low abundance levels, within an adequate time period. For ESUs with multiple populations, the spatial scale and diversity criteria for viable populations are addressed primarily by specifying the number of populations that must meet species-level biological requirements, as defined above. This is considered on an ESU-by-ESU basis, depending upon the degree to which populations, and their relation to one other within an ESU, have been delineated and the degree to which a mixture of populations within an ESU is required to maintain long-term evolutionary potential including survival in the face of catastrophic events and other long-term demographic processes (NMFS 1999 [12/12/99 VSP draft]). This information is poorly developed for most ESUs at present, therefore, where information to the contrary is absent, NMFS will assume that all populations within an ESU must meet the species-level biological requirements described above in order to conclude that the entire ESU is meeting those biological requirements.

4.5 Species Status With Respect to Species-Level Biological Requirements

The current status of each species, as described in Sections 4.1 - 4.3, indicates that the species-level biological requirements described in Section 4.4 are currently not being met. Although a quantitative

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[3] The regulatory terms "survival" and "recovery" are defined for use in the jeopardy/critical habitat analysis as follows:

Survival: The species' persistence, as listed or as a recovery unit, beyond the conditions leading to its endangerment, with sufficient resilience to allow for the potential recovery from endangerment. Said another way, survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a species with sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter.

Recovery: improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act. [50 CFR '402.02] "

(NMFS and FWS, *Section 7 Endangered Species Consultation Handbook -- Procedures for Conducting Section 7 Consultations and Conferences, March 1998)* (hereafter "the Consultation Handbook").

analysis of the likelihood that the ESU is meeting the biological requirements has not yet been completed (Section 6.1), the current endangered (UCR spring-run chinook salmon and steelhead) and threatened (MCR steelhead) status, coupled with continuing downward trends in survival rates and the dependency of some stocks on artificial production (Busby *et al.* 1996; Myers *et al.* 1998; updated information in Sections 4.1 - 4.3), indicates that improvements in survival rates (assessed over the entire life cycle) are necessary to meet species-level biological requirements in the future.

5. ENVIRONMENTAL BASELINE

5.1 Description of the Action Area

The action area includes all areas affected directly or indirectly by the Federal action [50 CFR section 402.02]. Based on this definition, the action area relevant to UCR spring-run chinook salmon and steelhead and to MCR steelhead is defined as the mainstem Columbia River from the furthest downstream point to the furthest upstream point at which these species are affected by the FERC-licensed project under consideration. The furthest downstream extent of the action area is not clearly understood. However, in years of high river discharge or under otherwise high spill conditions, the direct effects associated with high concentrations of dissolved gas may extend below the Priest Rapids Dam, possibly as far downstream as the McNary Project. Backwater effects from the Wells Project reservoir continue upstream to the Chief Joseph Project. Therefore, for the purposes of this biological opinion, the action area for UCR spring-run chinook salmon and steelhead is the mainstem Columbia River from the McNary Dam at river mile 292 to the Chief Joseph Dam at river mile 545.

Except in cases where MCR steelhead overshoot the Yakima River, the action area for this species only entails the unimpounded section of the Columbia River between the McNary Dam and the Yakima River at approximately river mile 335. Adult MCR steelhead that overshoot the Yakima River may be affected to a greater extent.

5.2 Biological Requirements Within the Action Area

Within the action area, the biological requirements of UCR spring-run chinook salmon and steelhead are very similar to those of other salmonids in the Snake River and lower Columbia River migration corridors. These biological requirements stem from the essential features of the migration corridor, as described in the critical habitat designation for Snake River spring/summer chinook salmon, fall chinook salmon, and sockeye salmon (58 FR 68543). Therefore, the biological requirements for UCR spring-run chinook salmon and steelhead include adequate substrate, adequate water quality (including quantity, temperature and velocity), adequate cover and shelter, adequate riparian vegetation, adequate space, and adequate conditions for safe passage. The juvenile life stages of Pacific salmon additionally include an adequate food supply.

Although the action-area biological requirements of MCR steelhead are consistent with these elements,

the action area for MCR steelhead only entails the unimpounded section of the Columbia River between the McNary Dam and the Yakima River. Therefore, evaluation of the proposed actions will only require an analysis of the relevant essential features of critical habitat associated with this section of the action area, primarily, water quality for all life stages of MCR steelhead and an adequate food supply for the juvenile life stages. The remaining essential features of the migration corridor are specific to the Yakima River and other river systems that are not affected by the action considered in this Biological Opinion.

Defining a level of 'adequacy' through specific, measurable standards for many of these biological requirements is problematic. In many cases, the absolute relationship between the critical element and species survival is not clearly understood, thus limiting NMFS' ability to develop specific, measurable standards. However, some parameters established in the FCRPS (Federal Columbia River Power System) Biological Opinion will be utilized in this Biological Opinion to assist in analyzing and developing specific operational measures. The 135 kcfs minimum flow objective established for the Columbia River as measured at the Priest Rapids Dam in the 1998 FCRPS Supplemental Biological Opinion, and the maximum 120% total dissolved gas limit are two examples. For the remaining action-area biological requirements however, the available biological information is not sufficient to determine measurable levels of 'adequacy' with reasonable certainty.

The specific survival levels necessary to ensure that UCR spring-run chinook salmon and steelhead and MCR steelhead continue to exist into the future are also unknown at this time. A survival analysis that includes the direct effects of passage through all five FERC-licensed dams, the Hanford reach of the Columbia River, and the four Federal projects on the lower Columbia River is needed to estimate the direct, indirect, and cumulative effects of the proposed actions. This information should be considered in the context of species-level biological requirements, as described in Section 4.5. This additional information would allow NMFS to develop specific measurable survival rates at each project that are associated with meeting the species-level biological requirements. However, information on mortality in components of the life-cycle outside of the action area is incomplete, so the degree to which action area biological requirements must be achieved is largely a matter of judgement and, by necessity, includes a degree of uncertainty. NMFS is expected to provide the benefit of the doubt to the species of concern with respect to such gaps in the information base (H.R. Conf. Rep. No. 697, 96th Cong., 2nd Sess. 12 (1979)).

5.3 Status of the Species Within the Action Area

The past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all the proposed Federal projects in the action area that have already undergone formal or early Section 7 consultation, and the impacts of State or private actions that are contemporaneous with the consultation in process are all included within the environmental baseline [50 CFR section 402.02]. The environmental baseline encompasses the effects of both human and natural factors leading to the current status of the species, but does not incorporate impacts specific

to the proposed actions. Therefore, future impacts resulting from the continued operation of the Wells Hydroelectric Project and other activities authorized pursuant to the proposed actions are not included in the environmental baseline. Rather, the environmental baseline describes the current status of the species, and the factors currently affecting the species environment, within the action area. The resulting "snapshot" of the species' health within the action area provides the relevant context for evaluating the anticipated effects of the proposed actions on the current and future status of the ESU.

Although the action area described in Section 5.1 only encompasses a small part of the species' range, up to 100% of the juvenile and adult populations may be affected by a continuation of the human activities that contributed to the existing conditions in the migration corridor. Mortality and sublethal effects (e.g., changes in migration timing or speed) associated with river impoundments, dam passage, and other aspects of project operations within the action area in recent years are described in Section 6. These effects have influenced the current status of listed species, which as described in Section 4, does not meet species-level biological requirements. Maintenance or further degradation of the existing conditions within the action area would contribute to the current declining trend and thus would continue to increase the high risk of extinction on which the listings were based. Measures must be taken at the Wells Hydroelectric Project to avoid ongoing impacts that have contributed to the trend towards extinction and to aid in establishing improved conditions whereby each species will continue to exist into the future while retaining the potential for recovery. The successful implementation of these measures at the Wells Hydroelectric Project will be necessary for the proposed action to avoid jeopardizing listed species.

5.4 Factors Affecting Species' Environment Within the Action Area

The effects of the remaining four FERC-licensed Mid-Columbia River hydroelectric projects are also within the action area; consultations are occurring contemporaneously with this consultation, and the actions under consultation will affect UCR spring-run chinook salmon and steelhead and may affect MCR steelhead. Operations of the Rocky Reach, Rock Island, Wanapum, and Priest Rapids dams are currently governed by existing FERC license requirements and settlement agreements. Each of these license requirements and settlement agreements specify specific actions intended to reduce the effects of project operations on anadromous salmonids.

In addition to the hatchery consultations discussed in Section 3.2.1.5, a spring flow objective for the Mid-Columbia River was established in the 1998 FCRPS Supplemental Biological Opinion (NMFS 1998). The flow objective established for steelhead migrating through the Columbia River above the McNary Dam is 135 kcfs as measured at the Priest Rapids Dam.

It is unclear at this time how the cumulative effects of FERC-licensed and FCRPS hydroproject operations affect long-term fish health and survival. Therefore, given that this gap in our understanding constitutes a critical uncertainty during this interim period, NMFS believes that additional actions should take place at each of the FERC-licensed projects in order to maximize the survival of all life stages of

UCR spring-run chinook salmon and steelhead through the action area.

6. EFFECTS OF PROPOSED ACTION

6.1 Analytical Methods

The IPP has been evaluated based on the five-part approach for applying the ESA jeopardy standard to Pacific salmon as developed in the 1995 FCRPS Biological Opinion, and in the 1998 Supplemental FCRPS Biological Opinion. The analysis involves the following steps:

- Define the biological requirements of the listed species (Sections 4.4 and 5.2).
- Evaluate the relevance of the environmental baseline to the species' current status (Section 5.4).
- Determine the effects of the proposed or continuing action on listed species (methods described in Section 6.1.1 and applied in Section 6.2).
- Determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed or continuing action, the environmental baseline and any cumulative effects, and considering measures for survival and recovery specific to other life stages (Section 6.3).
- Identify reasonable and prudent alternatives to a proposed or continuing action that is likely to jeopardize the continued existence of the listed species. This step is relevant only when the conclusion of the previously-described analysis is that the proposed action will jeopardize listed species. The reasonable and prudent alternative would have to reduce mortality associated with the proposed action to a level that does not jeopardize the species. An analysis to determine sufficiency of the reasonable and prudent alternative will be based on the same considerations described above.

6.1.1 Methods for Evaluating Effects on Action-Area Biological Requirements

During this step of the analysis, effects of the action are evaluated with respect to action-area biological requirements. The general considerations are discussed here, and a more detailed analysis is included in Section 6.2.

The primary approach to evaluating effects in the action area is to estimate juvenile and adult survival rates associated with the proposed action. Both direct and indirect (delayed) mortality are estimated to the extent possible. These survival rates should capture most, but not necessarily all, of the impacts

associated with meeting action-area biological requirements.

- Adequate Substrate and Adequate Food Supply for Juveniles: The impoundment of the Wells Project reservoir by the Wells Dam has probably changed the characteristics of substrate above Wells Dam from gravel and cobble to finer sediment size. However, this change in substrate is unlikely to affect adults or early life stages of the species subject to this consultation because both UCR steelhead and UCR spring-run chinook salmon are tributary spawners. It is possible that the change in substrate has influenced food production, possibly reducing feeding success and growth of smolts migrating through the impounded reach. However, evidence for this effect is speculative at present (ISG 1996, Chapter 6). If such an effect occurs, it is likely to be captured in either the direct survival or indirect mortality rates estimated later in this section. The presence of Wells Dam may also decrease gravel recruitment to downstream reaches. This later effect would be most likely to influence the spawning success of Mid-Columbia River mainstem spawning species.

- Adequate Water Quality: The primary characteristics of water quality affected by operations of the Wells project are total dissolved gas levels and temperature (Section 6.2.5).

- Adequate Cover and Shelter: Impoundment of the Wells Project reservoir has modified the physiographic complexity of this reach compared to conditions in a free-flowing river, resulting in a modification of cover and shelter and a potential change in predation on juveniles of listed species. This effect would presumably be observable in estimates of juvenile survival, which are the focus of our approach to evaluating effects (Section 6.2). Additionally, the PUD has proposed a program to remove predators from areas where juveniles are most vulnerable to predation (Section 8.1.9).

- Adequate Riparian Vegetation: Impoundment has likely changed the riparian vegetation within the study reach from pre-impoundment conditions. Regulation of the Wells Hydroelectric Project reservoir elevation may influence the distribution and composition of riparian vegetation in the study area. Riparian vegetation is likely to influence cover, food production, temperature, and substrate, so the primary effects are addressed with respect to other factors. Additionally, effects of changes in riparian vegetation resulting from the proposed action are likely to be expressed in the survival rates of juveniles and adults (Section 6.2).

- Adequate Space and Conditions For Safe Passage: The configuration of the Wells Dam and the proposed operation of the Wells project primarily affect the safe passage of juveniles and adults through the action area (Section 6.2).

6.1.2 Methods for Evaluating Effects on Species-Level Biological Requirements

Ideally, the effects of the proposed action on the species-level biological requirements would be

evaluated using an analysis that combined expected survival through the action area, as described in Section 6.2, with expected survival through other life stages to determine if there was a high likelihood of survival and a moderate to high likelihood of recovery. Such an analysis is currently in progress and is a component of the proposed action, but is not complete at this time. For this reason, NMFS must evaluate the likelihood that species-level biological requirements will be met during the course of the proposed action using qualitative considerations, as in the 1998 and 2000 Supplemental FCRPS Biological Opinions.

The key qualitative considerations for making a determination in the absence of a life-cycle analysis are:

- Will the interim action provide for "implementation of all reasonable measures for the operation and configuration of [the Wells Hydroelectric Project] that will reduce the mortalities of listed fish" (1995 FCRPS Biological Opinion, p. 91) and include studies to support the choice of a long-term action that will meet species-level biological requirements? Until the best long-term action is chosen and implemented, the interim action must aggressively pursue improvements in survival to ensure that the status of listed species does not deteriorate further while a long-term action is being developed. Completion of the studies and analysis during the interim period are necessary to ensure that the long-term action will meet the species-level biological requirements.

- Will a long-term action that meets these criteria be proposed within a limited period of time, including all necessary permits and authorizations for its implementation? The interim period must be finite and this time must be used to ensure that an adequate long-term proposal will be in place at the end of this period.

In this biological opinion, because a direct analysis of the proposed action in the context of the life cycle is not possible, these criteria will be the basis for evaluating whether or not the interim action is likely to meet the species-level biological requirements.

6.2 Effects of Project Operations on the Migration and Survival of Listed Salmonids - General Considerations

There are five non-Federal hydroelectric dams on the Mid-Columbia River within the action area. All are licensed by FERC. These five dams include the Wells Hydroelectric Project located at RM 515.8, the Rocky Reach Project at RM 473.7, the Rock Island Project at RM 453.4, the Wanapum Dam at RM 415.8, and the Priest Rapids Dam located at RM 397.1. The Douglas County PUD owns and operates the Wells Hydroelectric Project, the Chelan County PUD owns and operates the Rocky Reach and Rock Island Projects, and the Grant County PUD owns and operates the Wanapum and Priest Rapids dams (collectively the Priest Rapids Project). UCR spring-run chinook salmon and steelhead from the Methow and Okanogan rivers must pass through all five of the PUD dams during their migrations to and from the Pacific Ocean. Entiat River spring-run chinook salmon and steelhead

must pass through four of the PUD dams and Wenatchee River spring-run chinook salmon and steelhead must pass through three of the PUD dams during their migrations to and from the ocean. Although MCR steelhead do not migrate through these projects, they are subject to variations in flow and other water quality issues that result from their operations.

The IPPs and Fish Passage Plans that FERC submitted to NMFS were prepared by the Douglas, Chelan, and Grant County PUDs. These documents contain proposed operations and measures intended to partially mitigate for the adverse effects associated with the continued operations of the five Mid-Columbia River hydroelectric projects. The combined effects of all five projects are unknown at this time, although many of the effects are likely cumulative.

This Biological Opinion analyzes the specific actions associated with operation of the Wells Hydroelectric Project. The hatchery compensation components of the Douglas County IPP are being addressed in other on-going NMFS consultations and will not be included in this Biological Opinion. Likewise, the effects of interim operations on listed species from the Rocky Reach , Rock Island, Wanapum and Priest Rapids dams are being addressed in other ongoing NMFS' consultations and are the subject of other biological opinions.

As discussed in more details in the following sections, the presence of these dams results in migration delay, thereby influencing migration speed and timing for both juvenile and adult salmon and steelhead. Additionally, a significant rate of juvenile injury and mortality occurs during their downstream passage through dams. Although the direct mortality of adults is likely minimal during passage at individual dams, each dam presents the potential for delays at fishway facilities, increased rates of energy expenditure in multiple fishways, increased incidence of involuntary fallback through the dam, and increased exposure to high concentrations of dissolved gases. Additionally, a percentage of adults fail to enter project fishways and pass upstream. This could be due to a fish's inability to detect fishway entrances or due to the lack of distinguishable environmental cues inducing fish to continue upstream past the project. As a result of these indirect effects, a component of the adult populations may fail to successfully spawn.

The hydropower system may also positively affect some aspects of the upstream migration. For example, travel time and energy expenditures of the upstream migrants are reduced in reservoirs relative to free flowing rivers. However, the true direction and magnitude of the effects, with respect to the cumulative effects on adult passage, are unknown.

As discussed in Section 6.1.1, the primary method for evaluating the effects of the proposed action on the biological requirements of listed species in the action area is through analyses of survival. At the Wells Hydroelectric Project, the survival of UCR spring-run chinook salmon and steelhead is most affected by the effects of:

- Project operations on juvenile salmonid passage, including passage through turbines,

bypass systems, and spill
- Project operations on adult salmonid passage
- The project reservoir
- Project operations on water quality
- Predator control program

The level of uncertainty surrounding the available information regarding these effects can not be overstated. The survival of juvenile salmonids was first assessed 1982 and 1983 (McKenzie *et al.* 1983, 1984) although dam-specific estimates were not calculated. Additional evaluations were attempted in 1985 and 1986 by the Fish Passage Center, but the information collected is considered to be unusable due to significant problems experienced during execution of the study. Eppard *et al.* (1999) conducted a pilot PIT (Passive Integrated Transponder) tag survival study in 1998, and although certain assumptions were violated for specific release groups, the data is considered the best available for the lower four Mid-Columbia River PUD dams. The Douglas County PUD also conducted a pilot level PIT tag survival evaluation in 1998 utilizing hatchery reared juvenile UCR spring-run chinook salmon (Bickford *et al.* 1999). The results of this evaluation satisfied the majority of the study assumptions and are considered the best source of juvenile chinook salmon survival information for the Wells Hydroelectric Project. In 1999, the Douglas County PUD utilized similar methodologies to evaluate the survival of hatchery reared steelhead (Bickford *et al.* 2000). Although only one year of data is available, this test also satisfied the study assumptions and is considered the best source of juvenile steelhead information for the Wells Hydroelectric Project.

There is very little data available to assess the survival of adult UCR chinook salmon or steelhead. Radio-telemetry evaluations conducted between 1993 and 1998 contain the bulk of the available information, although survival was not specifically addressed in any of these studies (Stuehrenberg *et al.* 1995; Alexander *et al.* 1998; English *et al.* 1998; Peery *et al.* 1998; English *et al.* 1999; Nass *et al.* 1999). Radio-tagged adult migrants that were not detected in known spawning areas may be an indication of prespawning mortality. However, adults spawning in unknown areas, regurgitated tags or unknown harvest rates could all bias estimates of prespawning mortality associated with the hydrosystem. Excessive delay reported at fishway entrances and fallback over dams are the most pronounced problems adults experience in their upstream migrations that can be assessed using radio-telemetry techniques. Therefore, past evaluations have focused largely on defining these issues. The lack of adequate adult survival information significantly increases the level of uncertainty associated with this analysis.

The majority of the information utilized in this Biological Opinion was developed through radio-telemetry, hydroacoustic, PIT-tag and balloon-tag methodologies. Each of these methodologies contains a considerable level of uncertainty. When utilized in total, they support the conclusions reached in this analysis, although additional evaluations should continue to be coordinated with NMFS and executed by the PUD to update the available information with more precise measurements of survival.

6.2.1 Effects of Project Operations on Juvenile Salmonid Passage - General Considerations

Juvenile salmon and steelhead pass the Mid-Columbia PUD dams through various routes including turbines, bypass systems, and spillways. Some juvenile mortality is associated with all dam passage routes although the highest levels of mortality typically occur during passage through turbines (Whitney *et al.* 1997). Therefore, to increase survival, an important objective of project operations is to route the highest possible proportion of juveniles past the projects in a manner that avoids passage through turbines. The proportion of smolts that pass a project through bypasses or over spillways is an important indicator of the effectiveness of fish passage protection measures and is essential information for estimating the overall survival of juvenile salmon and steelhead passing a project. Project FPE (fish passage efficiency) varies annually due to changes in environmental conditions and powerhouse operations.

6.2.1.1 Juvenile Salmonid Passage Through Turbines - General Considerations

Turbine survival studies for juvenile passage published through 1990 at the Snake and lower Columbia River dams have been reviewed by Iwamoto and Williams (1993). The Independent Scientific Group (ISG 1996) and Whitney *et al.* (1997) reviewed studies published through 1995, including several from the Mid-Columbia River projects. Turbine mortality has been estimated primarily for juvenile salmon, although at least two studies have estimated steelhead mortality (Weitkamp *et al.* 1986; Olson and Kaczynski 1980). Estimates of turbine mortality vary greatly among studies, ranging from 2.3% to 19%. Whitney *et al.* (1997) pointed out that in studies where marked fish were immediately recovered in the tailrace, mortality estimates were less than seven percent (average 5.5%). In studies with longer times between turbine passage and recovery, mortality levels averaged 10.9% (Whitney *et al.* 1997). Whitney *et al.* (1997) also suggested that the lower survival estimates likely included some level of mortality not directly associated with turbine passage such as predation on disoriented smolts.

In recent years, evaluations of turbine mortality were conducted under turbine operations presumed to provide the best conditions for fish (i.e., turbine operations within 1% of peak efficiency). The NMFS studies of turbine survival in the Snake River produced estimates of 92.7%, 92.0%, and 86.5% at Lower Granite, Little Goose, and Lower Monumental Dams in 1995, 1993, and 1994, respectively. Steelhead survival from turbine passage at Little Goose Dam in 1997 was 93.4% (Muir et al. in review - N. Am. J. Fish. Manage.). Total turbine passage survival estimates at the Wells Project that include both the direct and indirect components of mortality are likely to be similar to the average of these estimates (91.2%) due to the operations proposed in the IPP to maximize fish passage survival.

6.2.1.2 Juvenile Salmonid Passage Through Bypass Systems - General Considerations

Estimates of the direct survival rate of juvenile salmon and steelhead through bypass systems includes mortality rates associated with turbine intake screens, gatewells, orifices, bypass flumes, dewatering

screens, sampling facilities (including holding tanks), and bypass outfall conduits. Estimates of direct bypass mortality found at sampling facilities for the bypass systems at the Federal hydroelectric projects on the Snake and lower Columbia rivers suggest that the direct mortality of both wild yearling steelhead and chinook salmon is generally less than one percent (Martinson *et al.* 1997; Spurgeon *et al.* 1997; summarized in NMFS FCRPS Supplemental Biological Opinion 1998) although some level of stress or injury may result in mortality later in the life cycle. Bypass survival may also be indirectly affected by predation at poorly located outfall sites or by delayed mortality associated with injury caused by the bypass system. Bypass system outfalls that concentrate juvenile salmon and steelhead into a comparatively small volume of water may cause high levels of predation related mortality.

The juvenile bypass system at the Wells Hydroelectric Project is unique in that the hydro-combine design incorporates spillway gates between each of the turbine units. These spillway gates have been modified over the last several years to maximize both fish passage efficiency and effectiveness. As a result, fish are bypassed over the project in considerably more flow than is typically associated with standard bypass systems. In addition, the Wells Hydroelectric Project bypass system does not have the guidance screens, dewatering structures, or monitoring facilities that have traditionally increased injury to salmonid outmigrants.

6.2.1.3 Juvenile Salmonid Passage Through Spill - General Considerations

Whitney *et al.* (1997) reviewed 13 estimates of spill mortality (three for steelhead and 10 for salmon) published through 1995 and concluded that zero to two percent mortality is the most likely range for standard spill bays. However, they also pointed out that local conditions such as back eddies, or other situations that may favor the presence of predators, may lead to higher spillway passage mortality. In general however, relative to other means of passage currently available, spillways are the most benign routes for juveniles to pass the Mid-Columbia River projects (Chapman *et al.* 1994a; Chapman *et al.* 1994b). Unfortunately, increasing spill may result in higher levels of TDG and thus a greater incidence of gas bubble trauma (GBT) in UCR spring-run chinook salmon and steelhead. As a result, the survival of both the juvenile and adult life stages may be reduced. This emphasizes the importance of the physical and biological TDG monitoring programs at the PUD and Federal dams.

6.2.2 Specific Effects of the Wells Hydroelectric Project Operations on Juvenile Salmonid Passage and Survival

The following information analyzes the specific effects that operation of the Wells Hydroelectric Project have on listed juvenile salmon and steelhead. The NMFS reviewed the analyses contained in the biological assessment provided by the PUD and considered additional data where appropriate. Based on the information provided, the total project survival of juvenile UCR spring-run chinook salmon ranges from 89.6% to 103.3% (weighted average = 99.7%) and ranges from 85.9% to 111% (weighted average = 94.3%) for steelhead.

6.2.2.1 Juvenile Salmonid Passage Through the Turbine Units at the Wells Hydroelectric Project

Approximately 8% of the steelhead and spring-run chinook salmon outmigrants pass through the turbines at the Wells Dam (Skalski, 1993). However, estimates of turbine passage survival have not been updated following improvements made to the turbine units in the late 1980s. The biological assessment noted specific features that may improve project survival, such as low levels of cavitation, relatively low head, and downstream conditions specific to the Wells Hydroelectric Project that may reduce tailrace mortality, however, there is little information available at the Wells Hydroelectric Project to support these assumptions. Recent survival evaluations indicate that total project survival is quite high, but route specific information was not obtained. In addition, predation continues to occur even with the extensive control measures implemented at the project. Therefore, the 91.2% average survival level representing both the direct and indirect effects of project operations on survival (based on turbine operations at maximum efficiency) is considered the best current indication of the smolt survival rate for powerhouse passage at the Wells Hydroelectric Project.

6.2.2.2 Juvenile Salmonid Passage Through the Bypass System at the Wells Hydroelectric Project

Hydroacoustic studies conducted from 1991 through 1993 at the Wells Hydroelectric Project estimated that 92% of the spring outmigrants, which include both juvenile chinook salmon and steelhead, were guided through the juvenile bypass system (Skalski 1993). These estimates were supported by similar information collected during concurrent fyke net evaluations (Bickford 1997). To assess the direct effects of the bypass system on injury and survival, the PUD conducted a juvenile chinook salmon balloon-tag study in 1993 (RMC Environmental 1993). Injury rates and mortality of bypassed fish were not statistically different from the control groups.

The indirect effects of passage through the bypass system have not been evaluated at the Wells Hydroelectric Project. Although project survival evaluations have been conducted (Section 6.2.4), there is no way of determining what component of the survival estimate is related to the indirect effects of passage through the bypass system. However, several of the factors associated with indirect mortality at other projects appear to be largely mitigated at the Wells Hydroelectric Project. For example, juvenile outmigrants are not concentrated in reduced outflow where they may be susceptible to higher predation rates, and TDG is minimized. As a result, the biological assessment provided by FERC suggests that indirect mortality is 0%. However, in the absence of specific studies evaluating indirect mortality at this project, and given the known presence of predators in the tailrace, NMFS makes the conservative assumption that total direct and indirect mortality is similar to the 2% mortality rate estimated at the outfalls of the Lower Snake River project bypass systems (NMFS 1998 FCRPS Supplemental Biological Opinion).

In order to determine current run timing information, the Douglas County PUD has also proposed to

continue fyke net sampling. Information from this effort will be used to establish accurate initiation and termination dates for operation of the bypass system. The dates proposed for fyke netting are outside of the known steelhead outmigration period and, therefore, are only expected to minimally effect this fish. In addition, only one turbine unit will be monitored with a single row of nets, greatly limiting the effects on yearling chinook salmon. Based on samples collected in 1998 and 1999, no more than 10 yearling steelhead and 75 yearling chinook salmon are expected to be killed during this process. This number of fish is significantly less than 1% of the populations.

6.2.2.3 Juvenile Salmonid Passage Through the Spillway at the Wells Hydroelectric Project

Unlike typical Columbia and Snake River hydroelectric projects, the Wells Hydroelectric Project incorporates the powerhouse and the spillway into a single structure. The Douglas County PUD has modified the intermittent spillbays to further incorporate a highly effective surface bypass system. Therefore, the unmodified spillbays are typically not utilized for juvenile fish passage. As noted in Section 6.2.2.2, the surface bypass system is effective at guiding approximately 92% of the juvenile UCR spring-run chinook salmon and steelhead through the project (also note Skalski 1993 and Skalski *et al.* 1996).

6.2.3 Effects of Project Operation on Adult Salmonid Passage - General Considerations

Three specific components of the adult migrations through the Mid-Columbia River corridor may affect listed species: delay at project fishways, passage success at project structures, and injuries and mortalities resulting from upstream and downstream passage through project facilities. Each of these components has the potential to increase prespawning mortality. For fish that do reach spawning areas, indirect effects associated with passage through multiple dams may reduce fecundity and reproductive success. Unfortunately, the relationship between each of these passage measures and reproductive success is not clearly understood.

Adult spring-run chinook salmon and steelhead pass upstream through the five Mid-Columbia River PUD dams via fishways that were installed during the original construction of the projects. The fishways typically consist of an entrance gallery and ladder, a diffuser system that provides additional water at the ladder entrances (to attract fish from the tailrace), and a flow control section at the ladder exit that maintains ladder flow over varying forebay elevations. Observation areas have been established in each ladder to monitor upstream progress and the Wells and Priest Rapids dams have ladder traps for broodstock collection and monitoring. Migrational delays are most likely to occur at fish ladder entrances, in the collection galleries, and during operation of the traps. Injury related to fish passage facilities is usually minimal, however system failures (especially at diffuser gratings in the entrance pools) can result in significant injury and mortality.

Adult passage information (e.g., time spent immediately downstream of the dam, success at passing into the collection channel and fishway entrances, time taken to traverse the ladder, etc.) is typically

evaluated utilizing radio-telemetry techniques. Therefore, project passage information is an assessment of how well radio-tagged fish pass from the tailrace of a specific dam into and through the fishladders. The underlying assumption is that the behavior of radio-tagged fish is generally similar to untagged fish. Laboratory assessments of tagged and untagged fish and several years of field evaluations support this assumption, although little information is available regarding tagging effects on reproductive success. There has not been a direct relationship established between project passage times and reproductive success, although reducing passage times to the greatest extent possible should reduce energy expenditures and improve the likelihood that adult fish will survive to spawn. Although specific criteria are not available, obvious delays in passage may indicate a need for operational or structural modifications.

Adult radio-tagged fish are monitored with aerial and underwater antennas as they move through the tailrace and into and through the fishladders. Additional information can be collected by manually tracking radio-tagged fish from a boat or plane. Project passage times are only developed for radio-tagged fish that successfully bypass the dam. Although fish that do not pass the dam are of equal or greater concern, it is extremely difficult to determine a causative factor for this behavior. Failing to bypass a dam may result from poorly designed passage facilities, inadequate attraction water or complicated flow patterns exacerbated by project operations. Fish that fail to bypass the dam may also be destined for a downstream spawning location or may have been injured prior to reaching the dam (as a result of natural or other effects). Tagging effects or regurgitated tags can also be manifested in the data set and effect these conclusions, none of which are related to operation of the facilities. As a result, the detection rate of radio-tagged fish can not be used to isolate specific cause and effect relationships between passage and reproductive success. The information can be used however, to generally assess the success of adult salmonids migrating upstream through the Columbia River corridor and to develop an index that can be used to assess annual improvements in passage conditions.

Stuehrenberg *et al*. (1995) conducted the only Mid-Columbia River evaluation that attempted to determine the eventual fate of all radio-tagged chinook salmon first detected downstream of the Priest Rapids Dam. In this study, Stuehrenberg *et al*. (1995) estimated that the minimum survival rate of spring-run chinook salmon from the Priest Rapids Dam to the spawning grounds (or hatchery) was 77.8%. If all of the spring-run chinook salmon with unknown fates below the Priest Rapids Dam (N = 38) were fish from the Ringold Facility, the survival estimate would increase to 88.9%. In lieu of additional information specific to varying flow years or to steelhead, this assessment will be used as an estimate of total system effects in the interim period. As discussed above, it is not possible to differentiate natural effects from system related effects at this time.

Additional survival information is currently being compiled in the QAR and will supplement this information when available. In addition, each of the PUDs is participating in system wide radio-telemetry evaluations for UCR steelhead that will also provide information. The survival of downstream migrating adult steelhead, or kelts, is unknown. In addition, it is unknown at this time if steelhead kelts represent a significant component of the population or are surviving to spawn. Hydrosystem effects on

the reproductive success of UCR spring-run chinook salmon and steelhead are also unknown.

6.2.3.1 Effect of the Wells Hydroelectric Project Operations on Adult Salmonid Passage

The median project passage time for adult spring-run chinook salmon that successfully bypassed the Wells Hydroelectric Project was 28.5 hours during a 1993 evaluation (Stuehrenberg *et al*. 1995). For comparison, summer and fall chinook radio-tagged during this same evaluation passed the project in 46.9 hours and 45.6 hours respectively. Similar project passage rates have been observed at other Mid-Columbia, Lower Columbia and Snake river dams for adult spring-run chinook salmon. Stuehrenberg *et al*. (1995) also noted that fish successfully bypassing the project moved directly into the collection channel from the tailrace with minimal delay. The majority of the passage delay identified in this study was associated with the collection channel itself. Of the 28.5 hour median project passage time, over 90%, or 26.8 hours was spent attempting to negotiate the collection channel. Radio-telemetry evaluations conducted with other species in 1997 and 1998 demonstrated similar delay in the collection channel.

The 1993 telemetry evaluation also estimated a 3.6% fallback rate at the Wells Hydroelectric Project for spring-run chinook salmon (two of 56 radio-tagged spring-run chinook). Both of these fish were later detected in the Entiat River, indicating that, in passing the Wells Dam, the fish likely overshot their natal tributary. The only other data available for UCR spring-run chinook salmon at the Wells Hydroelectric Project is some limited fallback information in Alexander *et al*. (1998). Although spring-run chinook salmon were not specifically monitored in this evaluation, some incidental information specific to spring-run chinook salmon radio-tagged at the Bonneville Dam was included in the study. Of the seven fish detected, two spring-run chinook salmon (29%) fell back over the dam and did not reascend.

Alexander *et al*. (1998) also provided information on steelhead. Of the 20 radio-tagged steelhead that were detected at the Wells Hydroelectric Project, 16 (80%) successfully passed and remained above the dam during the study period. Of the four fish last located below the dam, two (10%) were last detected at the Wells Hatchery and two (10%) were last located in the tailrace. For the fish that successfully negotiated the dam, the median project passage time was 9.6 hours. Once upstream of the dam, the median migration rate to the Methow River was 25.4 km/d but only 7.2 km/d to the Okanogan River. Only one fallback occurred during the study period and that fish never reascended the dam.

Because there is a summer chinook hatchery downstream of the Wells Hydroelectric Project and fall chinook are known to spawn in this area, sockeye is probably the only other radio-tagged species evaluated at the Wells Hydroelectric Project that could reasonably be used to assess potential fallback effects related to project operations. In 1997, 3.5% of the radio-tagged sockeye fell back over the dam (English *et al*. 1998).

During the 1993 evaluation, approximately 12% (n = 8) of the radio-tagged spring-run chinook salmon detected in the Wells Hydroelectric Project tailrace were not detected upstream of the project or at any of the monitoring locations downstream of the dam (Stuehrenberg *et al.* 1995). Alexander *et al.* (1998) also noted that 20% (n=4) of the steelhead and 29% (n=2) of the spring-run chinook salmon failed to negotiate the dam in 1997. It is unclear whether these fish dropped back downstream to the Entiat River, the Wenatchee River, or in the case of steelhead, to the Wells Fish Hatchery. These results may indicate, however, a need for structural or operational modifications to the facilities. More refined analysis of this situation should occur during upcoming telemetry studies proposed at the Wells Hydroelectric Project.

The Douglas County PUD provided additional radio-telemetry information from several river systems in British Columbia, Canada. Radio-telemetry studies conducted on the Nass River in 1992 and 1993 (Koski *et al.* 1993, Koski *et al.* 1996) documented spring-run chinook salmon survival between 81% and 90%. In 1993, under different flow conditions, survival was 70% (Koski *et al.* 1994, Koski *et al.* 1996). Spring-run chinook salmon survival on the Kitsumkalum River in 1995 was estimated at 92% (Alexander and English 1996). Survival rates for summer run steelhead on the Skeena River ranged between 31% and 83% (Koski *et al.* 1995). Based on this information, they conclude that the 11.1% to 22.2% mortality estimated by Stuehrenberg *et al.* (1995) for the Mid-Columbia River in 1993 falls within the range of expected natural mortality. Similar pre-dam information is unavailable for the Mid-Columbia River although one estimate of spring/summer chinook survival developed for the period 1962 through 1968 on the lower Snake River averaged 55% with only one dam in place (estimated by relating ladder counts at Ice Harbor Dam with redd counts in Snake River tributaries)(Bjornn *et al.* 1998c, excerpted from the NMFS White Paper on juvenile and adult salmon passage).

Each of these techniques for determining survival incorporates several estimates and assumptions that all lead to significant uncertainty in the information base. For example, the survival estimates developed for the Snake River in the 1960s utilized the redd counts of adult spring/summer chinook that had been affected to some degree by the hydrosystem. Fish entering the Snake River system in 1962 had still traversed five hydroelectric facilities, each with some effect on both the juvenile and adult life stages of this species. Although Snake River fish are arguably more similar to UCR spring-run chinook salmon and steelhead than are species adapted to coastal river systems in British Columbia, a direct comparison of the survival rates between any of these species is problematic. Due to the limited amount of radio-telemetry information available for the Mid-Columbia River system, the pitfalls associated with utilizing radio-telemetry data to assess site specific survival, and the environmental and species differences of the natural and impounded river systems evaluated, it is not possible to differentiate between natural and hydrosystem caused mortality at this time.

The PUD has included a plan in their IPP to address many of the likely ladder system impacts on adult migrants at the Wells Hydroelectric Project. They will also continue to evaluate structural and operational modifications to improve flows in the fishway junction pools, to increase adult access efficiency to the ladder systems and to prevent fallback to the extent practicable. The PUD will also

execute various actions that should further ensure that levels of direct and indirect mortality related to unforeseen problems are eliminated to the extent practicable. In addition to these actions, as appropriate technology is developed, adult survival will be estimated for varying flow conditions and year classes to assess both the existing conditions and improvements intended to increase project survival over the status quo.

6.2.4 Effects of Reservoirs on Salmonid Migration and Survival - General Considerations

The physical effects of water regulation and impoundment are well known (e.g., NRC 1995, NMFS 1995a; ISG 1996) and can be related to the biological requirements of UCR steelhead and spring-run chinook salmon and MCR steelhead in the migration corridor. Water regulation at Federal projects modifies the river's natural hydrograph and has an impact on the ocean area influenced by the Columbia River plume. Water regulation reduces flows that would naturally occur in the spring and this, in turn, reduces water velocity. Water velocity is further reduced by impoundments on the mainstem river sections, increasing volume and cross sectional area and creating reservoirs from formerly free-flowing river sections.

Water regulation and impoundments also change water quality factors such as temperature (increased due to mass heat storage) and turbidity (decreased), as well as salmonid prey production (which changes from riverine aquatic insects to lacustrine planktonic organisms). Channel complexity is also reduced in reservoirs, which affects the complexity of fluid dynamics and substrate type (ISG 1996). Load following power operations may impact juvenile outmigrants by reducing the available food sources and by stranding and entrapping newly emergent fry.

6.2.4.1 Effects of the Wells Hydroelectric Project Reservoir on Salmonid Migration and Survival

In 1998, the PUD began assessing the relative survival of PIT-tagged run-of-river[4] and hatchery reared chinook salmon through the Wells Hydroelectric Project reservoir and dam (Bickford *et al.* 1999). Although route specific passage information was not obtained, results of this study indicated a comparatively high survival rate of the hatchery reared spring-run chinook salmon through the pool and dam relative to a reference group released in the tailrace. Survival rates through the Wells Hydroelectric Project reservoir and dam for PIT-tagged run-of-river and hatchery reared chinook salmon ranged from 73% to 103.3% in 1998 (Bickford *et al.* 1999). The weighted mean survival rate of hatchery reared yearling chinook salmon averaged 99.7% (SE 0.015) during 1998.

Bickford *et al.* (1999) did not release run-of-river fish in the tailrace of the Wells Hydroelectric

[4]The run-of-river chinook salmon tagged in 1998 were all hatchery origin fish, either from the Winthrop hatchery or from the Methow acclimation and release station. These fish were screw trapped in the Methow River near its confluence with the Columbia River.

Project, therefore, survival information for run-of-river fish could only be developed for the entire reach beginning at Pateros and ending at the Rocky Reach Dam (the next dam downstream). Survival estimates of the run-of-river fish over this reach was 70.4% as compared to the 95.7% estimated for the hatchery-reared spring-run chinook salmon. Differences in average fish size, health and smoltification were likely responsible for the discrepancies. Differences in fish size and ATPase levels alone were likely less important than the incidence of BKD (Bacterial Kidney Disease) in run-of-river chinook.

Using similar methods in 1999, Bickford *et al.* (2000) determined that the survival of yearling hatchery steelhead smolts through the Wells Hydroelectric Project reservoir and dam ranged from 85.9% to 111%. The weighted average survival was 94.3% (SE = 0.016) during 1999.

Adult spring/summer chinook salmon migration rates through the free flowing river sections above Lower Granite Dam range from 10 to 30 km/day and steelhead migration rates are generally less than 11 km/day (Bjornn 1998c, NMFS 2000). Adult passage through the Wells Project reservoir to the Okanogan River was estimated at 7.2 km/d for steelhead (Alexander *et al.* 1998). This is below the minimum expected passage rate estimated for natural river systems (Okanogan River chinook are considered part of the summer/fall ocean type population and are not listed). Travel times through the Wells Project reservoir to the Methow River, however, have been estimated at 12 km/day for spring-run chinook salmon (Stuehrenberg *et al.* 1995) and 25 km/day for steelhead (Alexander *et al.* 1998). Passage times to the Methow River are more reflective of estimated natural river conditions.

Based on the information from these studies, there may be some adverse effects of reservoir passage on the migration rate of adult steelhead destined for the Okanogan River. However, the available information does not lend itself to determining where these effects are occurring, or what may be responsible. Alexander *et al.* (1998) did note that a thermal barrier in the Okanogan River likely precluded adults from entering this system in 1998. This may result in delay in the mainstem Columbia River and would not be related to operations of the Wells Hydroelectric Project. However, it is unclear from the information if adults may be affected from other pool related or hydrosystem anomalies. Additional information will be collected to further resolve these reservoir passage issues and to determine if they effect prespawning survival.

6.2.5 Effects of Project Operations on Water Quality - General Considerations

At the Mid-Columbia River projects, spillways are currently the most benign routes for juvenile salmonids to pass the dams (Chapman *et al.* 1994a; Chapman *et al.* 1994b). Unfortunately, spill may result in TDG which may increase the incidence of gas bubble disease (GBD) in juvenile and adult salmonids. GBD can cause stress, injury and mortality in juvenile and adult salmon and steelhead. For these reasons, the Mid-Columbia River PUDs will limit voluntary spillway discharge levels during the fish passage season to ensure that TDG does not exceed 120% of saturation in project tailraces or 115% of saturation in project forebays for more than 12 hours over a 24 hour period. Due to these

operational constraints, mortality related to GBD will be limited under normal operating conditions.

6.2.5.1 Effects of the Wells Hydroelectric Project Operations on Water Quality

Due to the efficiency of the surface bypass system at the Wells Hydroelectric Project, large volumes of spill are typically not required to maximize juvenile salmon passage through non turbine routes. Therefore, under normal operating conditions, the Wells Hydroelectric Project does not produce significant increases in TDG (<2%) above those measured in the project forebay. Survival, therefore, is not expected to be affected as a result of TDG generated by the Wells Hydroelectric Project spillway under normal operating conditions. Elevated levels of TDG may result from involuntary spill during high river discharges, however, increasing the incidence of mortality related to GBD. It is unknown if these TDG effects carry downstream as far as the Hanford reach where they may effect listed MCR steelhead.

6.2.6 Effects of the Predator Control Programs on Salmonid Migration and Survival - General Considerations

In order to reduce the predation rates on juvenile migrants, the PUD has proposed to continue implementing Northern Pikeminnow (*Ptychochelus oregonensis*) removal and avian predator control measures. Avian control measures consist largely of land based activities that include gull wires installed across project tailraces and pyrotechnics to discourage predation. These activities do not affect listed species and therefore do not require special permitting. Removal of pikeminnows, however, may result in a take of listed species depending on the harvest methods used (e.g., hook and line, gill netting, electrofishing).

6.2.6.1 Effects of the Wells Hydroelectric Project Predator Control Measures on Salmonid Migration and Survival

The PUD removed over 7,000 adult Northern pikeminnow from the tailrace and reservoir of the Wells Hydroelectric Project in 1998 and over 10,382 in 1999. No steelhead or spring-run chinook salmon were taken or harassed as a result of these predator removal efforts (Jerald 1999). Similar Northern Pikeminnow removal efforts conducted from 1997 through 1999 at the lower Mid-Columbia River projects also recorded very little effect on listed species (West 1997, 1999; Stevens 1998, 1999). West (1997) reported two adult steelhead caught at the Rocky Reach Dam and released unharmed in 1997 and one adult steelhead caught and released unharmed at the Rock Island Dam in 1998 (West 1999).

6.2.7 Summary of the Effects of the Proposed Operations on Juvenile and Adult Salmonid Migrations at the Wells Hydroelectric Project

The available information indicates that approximately 92% of the juvenile outmigrants bypassing the

Wells Hydroelectric Project utilize the surface bypass system. The remaining 8% bypass through the turbine units (Section 6.2.2.). Average survival rates of 98% and 91.2% have been determined for the bypass system and turbine units respectively. Therefore, the total dam passage survival for UCR spring-run chinook salmon and steelhead is 97.5% [(Bypass passage rate X bypass survival) + (Powerhouse passage rate X powerhouse survival)].

Average survival rates through the Wells Hydroelectric Project reservoir and dam for yearling chinook salmon ranged from 73% to 103.3% in 1998 (Bickford *et al.* 1999) (Section 6.2.4) for hatchery and run-of-river chinook salmon. The weighted mean survival rate for hatchery chinook salmon was 99.7%. By factoring out the 97.5% dam passage survival estimate calculated above, the resulting reservoir survival rate averages 97.2%. The survival rate for run-of-river chinook salmon may be below this level as indicated by Bickford *et al.* (1999).

As a result of similar calculations using the data available for hatchery reared juvenile steelhead (Bickford *et al.* in draft), the resulting pool and dam passage survival rate ranges from 89.5% to 111% with a weighted average survival of 94.3%.

Based on the information presented in this analysis, the survival of juvenile UCR spring-run chinook salmon and steelhead is likely to be high given the proposed actions. It should be noted however, that only one survival evaluation has been conducted for each species and although the total sample size was relatively large in 1999, only five replicate treatment groups were released in this pilot level study of chinook salmon. Until these estimates are repeated over varying total river flow conditions and project operations, for each species, uncertainty about the actual survival estimates will remain.

At this time, there is no information specific to the survival of adult UCR spring-run chinook salmon and steelhead available for the Wells Hydroelectric Project. Based on the small amount of information that is available, the average survival of adult UCR spring-run chinook salmon and steelhead is estimated at between 77.8% and 88.9% for the entire action area (from below the Priest Rapids Dam to the known spawning areas). The percentage of the associated mortality attributable to the Wells Hydroelectric Project is unknown.

It is currently not possible to determine whether impacts to adult UCR spring-run chinook salmon and steelhead are within the range of natural mortality, or whether passage is affected by the proposed operation of the Wells Hydroelectric Project. The species characteristics that define UCR steelhead and spring-run chinook salmon make comparisons with other river systems problematic and unreliable. In addition, the effects of dam passage on spawning success are unknown. The available radio-telemetry information indicates a comparatively lengthy delay in the junction pool area of the fishladders. In addition, there is some indication that Okanogan River-bound UCR steelhead may be experiencing some delay in Lake Pateros which may be due in part to a thermal barrier on the Okanogan River. Reach survival estimates for UCR spring-run chinook salmon are only based on one year of information. Results of the 1999 steelhead passage study are not yet available.

6.3 Effects on Species-Level Biological Requirements

Ideally, NMFS should be able to determine the degree to which survival of listed species is expected to improve during the interim period in order to improve the likelihood of meeting species-level biological requirements. However, as stated in Section 6.1, analytical tools are not currently available for quantitatively evaluating the effects of the proposed actions on species-level biological requirements. Instead, qualitative factors are considered in this biological opinion. Specifically, the qualitative consideration is whether or not the interim action includes all reasonable measures for the operation and configuration of the Wells Hydroelectric Project that will reduce the mortalities of listed fish during the interim period. The specific proposed measures and their effect on survival in the action area are described in Section 6.2. Based on that review, NMFS is unaware of additional actions that can be implemented within the interim period to improve the survival of juvenile or adult UCR spring-run chinook salmon and steelhead or MCR steelhead at the Wells Hydroelectric Project.

As a second qualitative factor, NMFS considers whether or not a long-term plan will be developed during the interim period, if it will be accompanied by an analysis indicating that species-level biological requirements will be met as a result of the long-term action, and if all necessary permits and authorizations will be completed so that the long-term action can be implemented at the end of the interim period. As described in Section 3.2.2, Douglas PUD has already developed a long-term habitat conservation plan (HCP). Douglas PUD is participating in and funding (along with other PUDs, the Bonneville Power Administration, Corps of Engineers, and Bureau of Reclamation) a comprehensive analysis of the proposed long-term action on the biological requirements of UCR steelhead and UCR spring-run chinook salmon. This analysis is in review. NMFS is independently evaluating biological requirements of MCR steelhead and a preliminary, less comprehensive, analyses for this species should be completed at about the same time. This schedule suggests that, if the analyses indicate that modifications to the HCP are necessary to meet species-level biological requirements, adequate time will be available for making changes to the long-term plan. Concurrently, the NEPA review of the proposed HCP is occurring and is scheduled for completion by June 2001. ESA Section 10 (a)(1)(b) review of the proposed HCP is also scheduled to be complete by June 2001. Therefore, the proposed action is likely to result in completion of a long-term plan, analysis of that plan, and all permits and authorizations necessary to implement that plan prior to the end of the interim period (April 1, 2002).

7. CUMULATIVE EFFECTS

Cumulative Effects are defined in 50 CFR 402.02 as *those effects of future State, tribal, local or private actions, not involving federal activities, that are reasonably certain to occur in the action area considered in this Biological Opinion.* Future federal actions, including the ongoing operation of hatcheries, fisheries, and land management activities are not considered in this section because they require separate consultations pursuant to Section 7 of the Act. We are unaware of any

additional actions that are likely to occur within the action area.

8. CRITICAL HABITAT

The NMFS designated critical habitat for UCR chinook salmon and steelhead on March 17, 2000 (50 CFR Part 226). As described in previous sections of this Biological Opinion, operations of the Wells Hydroelectric Project may affect essential features of the migration corridor of listed UCR spring-run chinook salmon and steelhead and MCR steelhead by reducing water velocity due to water storage; by modifying passage conditions due to placement of dams, routing of a portion of fish through turbines, and creating optimum habitat for predators; and by increasing water temperatures. The analyses contained in the previous sections relate these changes in critical habitat to changes in the mortalities of listed UCR spring-run chinook salmon and steelhead and to MCR steelhead.

The analysis of whether the proposed action appreciably reduces the likelihood of both the survival and recovery of listed species encompasses the closely related determination of whether that operation appreciably diminishes the value of critical habitat for both the survival and recovery of listed species. In other words, evaluation of the relationship between the proposed action and the expected mortalities of listed species and the determinations of adverse modifications of critical habitat and jeopardy are combined into one analysis.

9. CONCLUSIONS

This section presents NMFS' opinion regarding whether the aggregate effects of the factors analyzed under the environmental baseline (Section 5), effects of the proposed action (Section 6), and the cumulative effects (Section 7) in the action area, when viewed against the current range-wide status of the species, are likely to jeopardize the continued existence of UCR spring-run chinook salmon, UCR steelhead, and MCR steelhead, or result in destruction or adverse modification of critical habitat.

9.1 Conclusions for UCR Spring-Run Chinook Salmon

After reviewing the current status of UCR spring-run chinook salmon, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NMFS' biological opinion that the proposed operation of the FERC-licensed Wells Hydroelectric Project is not likely to jeopardize the continued existence of this species and that there is adequate potential for recovery through April 1, 2002. Although there may be impacts to UCR spring-run chinook salmon, there are several critical uncertainties in the information base that currently preclude development of specific survival standards, migration timing standards, and escapement goals. The Douglas County PUD is proposing research efforts to resolve these uncertainties, and is proposing actions to reduce operational impacts to the extent possible in this interim period.

This conclusion is based on an assessment of the known impacts that may result from operation of

hydroelectric facilities and a determination of whether additional actions should occur to improve survival during this interim period. Based on the available information, the weighted average survival rates resulting from the proposed action are 99.7% for juvenile UCR spring-run chinook salmon, and greater than the 77.8% to 88.9% survival level established for adult UCR spring-run chinook salmon over the entire action area (i.e., from the Priest Rapids Dam to the Chief Joseph Dam tailrace). Because all reasonable interim actions for improving survival are being proposed and because the PUD has committed to implementing a long-term protection plan at the end of this interim period, it is expected that these levels of survival will meet species level biological requirements during this interim period.

9.1.1 Development of Long-Term Plans

As discussed in Section 6.3, the general framework for the proposed Wells Hydroelectric Project HCP has already been developed, the specific actions are currently being determined, and the National Environmental Policy Act (NEPA) and ESA Section 10 (a)(1)(b) reviews are scheduled to be complete by June 2001. At that time, information will be available from the studies currently underway, the QAR will be completed and will have identified the required escapement goals for UCR spring-run chinook, and the resources needed to address habitat issues will be available. The implementation of this long-term plan will then supercede the interim actions currently proposed by the Douglas County PUD. These processes are currently being expedited to the extent possible.

9.1.2 Effects of the Wells Hydroelectric Project Operations on Juvenile UCR Spring-Run Chinook Salmon Passage

The PUD will operate the surface bypass system 24 hours a day to protect at least 95% of the outmigration. The system is very effective, bypassing approximately 93% of the UCR spring-run chinook salmon. This level of guidance is extremely high when compared to other bypass systems on the Columbia and Snake rivers and no other actions are known that may further improve these results.

9.1.3 UCR Spring-Run Chinook Salmon Passage Through the Wells Hydroelectric Project Turbines

Only a small percentage (8%) of the UCR spring-run chinook salmon bypass the project through the turbine units. For these fish, the PUD is proposing to operate the turbine units as efficiently as possible throughout the juvenile fish migration. Juvenile salmonid survival is directly related to turbine efficiency. No other actions to further improve fish survival through the turbine units appear to be possible during the interim period.

9.1.4 UCR Spring-Run Chinook Salmon Passage Through the Wells Hydroelectric Project Bypass System

As discussed in Section 6.2.2.2, passage through the bypass system is comparatively high at the Wells

Hydroelectric Project. Other actions to further improve bypass efficiency are not known at this time. The available survival information indicates little if any direct impacts associated with bypass system operations, and the downstream conditions likely facilitate migration rates through the tailrace, maximizing survival.

9.1.5 UCR Spring-Run Chinook Salmon Passage Through the Wells Hydroelectric Project Spillway

The spillway is an integral component of the surface bypass system at the Wells Project. Extensive studies have been conducted to maximize the effectiveness of this system. Additional measures are proposed by the PUD to ensure TDG is minimized during high river flow operations. Adult monitoring is proposed to ensure that upstream migrants are not being impacted. No other actions to further improve survival appear to be feasible during the interim period.

9.1.6 Effects of the Wells Hydroelectric Project Operations on Adult UCR Spring-Run Chinook Salmon

There is no information available to assess the level of mortality associated either directly or indirectly with operation of the Wells Hydroelectric Project under the proposed action. However, fallback is comparatively low at this project compared to other mainstem hydroelectric projects and both fishladders will be operated to minimize adult UCR spring-run chinook salmon passage impacts and delay. The PUD is proposing additional studies to further address delay associated with passage through the junction pool, fallback, and unaccounted loss in the tailrace. They will also participate in studies to address spawning success and survival. No other actions to further improve survival appear to be feasible during the interim period.

9.1.7 Effects of The Wells Hydroelectric Project Reservoir on UCR Spring-Run Chinook Salmon Migration and Survival

The available information indicates that juvenile survival through the Wells Hydroelectric Project reservoir is comparatively high for hatchery reared chinook salmon. Additional testing is being proposed to ensure that naturally spawned juvenile UCR spring-run chinook salmon survival is equally high and to further verify these results over varying environmental and biological conditions. There are no indications that adult UCR spring-run chinook salmon are having difficulty negotiating the Wells Hydroelectric Project pool. No other actions to further improve survival appear to be feasible during the interim period.

9.1.8 Effects of the Wells Hydroelectric Project Operations on Water Quality

Due to the efficiency of the surface bypass system, large volumes of spill are typically not required to bypass juvenile UCR spring-run chinook salmon. This likely reduces the incidence of adult fallback and of high TDG and GBT levels. The PUD will monitor adult UCR spring-run chinook salmon for signs of

GBT and will continue to monitor TDG in the project forebay and tailrace. They are also proposing to investigate methods for reducing TDG under high river flow conditions. No other actions to further improve survival appear to be feasible during the interim period.

9.1.9 Effects of the Wells Hydroelectric Project Predator Control Measures

The predator control methodologies employed at the Wells Hydroelectric Project have not adversely affected UCR spring-run chinook salmon and the harassment and removal programs have been successful at reducing the number of piscivorous and avian predators. The bounty and sport fishing derby as described in Appendix F - Predator Removal and Harassment Plan of the IPP will likely result in few, if any, adverse effects on listed species. No other actions to further improve survival appear to be feasible during the interim period.

9.2 Conclusions for UCR Steelhead

After reviewing the current status of UCR steelhead, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NMFS' biological opinion that the proposed operation of the FERC-licensed Wells Hydroelectric Project is not likely to jeopardize the continued existence of this species and that there is adequate potential for recovery through April 1, 2002. Although there may be impacts to UCR steelhead, there are several critical uncertainties in the information base that currently preclude development of specific measurable survival standards, migration timing standards, and escapement goals. The Douglas County PUD is proposing research efforts to resolve these uncertainties, and is proposing actions to reduce operational impacts to the extent possible in this interim period.

This conclusion is based on an assessment of the known impacts that may result from operation of hydroelectric facilities and a determination of whether additional actions should occur to improve survival during this interim period. Based on the available information, the weighted average survival rates resulting from the proposed action is 94.3% for juvenile UCR steelhead and greater than the 77.8% to 88.9% survival level estimated for adult UCR steelhead over the entire action area (i.e., from the Priest Rapids Dam to the Chief Joseph Dam tailrace). Because all reasonable interim actions for approving survival are being proposed and because the PUD has committed to implement a long-term protection plan at the end of this interim period, it is expected that these levels of survival will meet species level biological requirements during this interim period.

9.2.1 Development of Long-Term Plans

As described in Section 6.2, the general framework for the proposed Wells Hydroelectric Project HCP has already been developed, the specific actions are currently being determined, and the National Environmental Policy Act (NEPA) and ESA Section 10 (a)(1)(b) reviews are scheduled to be complete by June 2001. At that time, information will be available from the studies currently underway,

the QAR will be completed and will have identified the required escapement goals for UCR steelhead, and the resources needed to address habitat issues will be available. The implementation of this long-term plan will then supercede the interim actions currently proposed by the Douglas County PUD. These processes are currently being expedited to the extent possible.

9.2.2 Effects of the Wells Hydroelectric Project Operations on Juvenile UCR Steelhead Passage

Operation of the surface bypass system will occur 24 hours a day to cover a period of time equal to at least 95% of the outmigration. The system is very effective, bypassing approximately 93% of the UCR steelhead . This level of guidance is extremely high when compared to other bypass systems on the Columbia and Snake rivers and no other actions are known that may further improve these results. No other actions to further improve survival appear to be feasible during the interim period.

9.2.3 UCR Steelhead Passage Through the Wells Hydroelectric Project Turbines

Only a small percentage (8%) of the UCR steelhead bypass the project through the turbine units. For these fish, the PUD is proposing to operate the turbine units as efficiently as possible throughout the juvenile fish migration. Juvenile survival is directly related to turbine efficiency. No other actions to further improve fish survival through the turbine units appear to be possible during this interim period.

9.2.4 UCR Steelhead Passage Through the Wells Hydroelectric Project Bypass System

As discussed above, passage through the bypass system is comparatively high at the Wells Hydroelectric Project. Other actions to further improve bypass efficiency are not known at this time. The available survival information indicates little if any direct impacts associated with bypass system operations and the downstream conditions in the project tailrace likely facilitate migration rates through the tailrace, maximizing survival. Although the timing of adult steelhead migrating downstream (kelts) is not clear, it is likely, based on their spawn timing, that they will bypass the Wells Hydroelectric Project during the juvenile fish passage season. It is also likely that passage over the bypass system will result in higher survival rates than passage through the turbine units. Operation of the surface bypass system will therefore benefit the kelt migration.

9.2.5 UCR Steelhead Passage Through the Wells Hydroelectric Project Spillway

The spillway is an integral component of the surface bypass system at the Wells Hydroelectric Project. Extensive studies have been conducted to maximize the effectiveness of this system. Additional measures are being proposed by the PUD to ensure TDG is minimized during high river flow operations and adult monitoring is being proposed to ensure that upstream migrants are not being impacted. No other actions to further improve survival appear to be feasible during the interim period.

9.2.6 Effects of the Wells Hydroelectric Project Operations on Adult UCR Steelhead

Fallback is comparatively low at this project compared to other mainstem hydroelectric projects and both fishladders will be operated to minimize adult UCR steelhead passage impacts and delay. The PUD are proposing additional studies to further address delay associated with passage through the junction pool, fallback, and unaccounted loss in the tailrace. They will also participate in studies to address spawning success and survival. Information for adult downstream migrants (kelts) is unavailable. In addition, methodologies for collecting this information are unclear. The PUD will, however, participate in kelt evaluations if appropriate technology can be developed. No other actions to further improve survival appear to be feasible during the interim period. No other actions to further improve survival appear to be feasible during the interim period.

9.2.7 Effects of The Wells Hydroelectric Project Reservoir on UCR Steelhead Migration and Survival

The available preliminary information indicates that juvenile survival through the Wells Hydroelectric Project reservoir is comparatively high for hatchery reared steelhead. The PUD is proposing additional studies to further verify these results over varying environmental and biological conditions. There is some indication however, that Okanogan River-bound adult UCR steelhead may be delaying in the reservoir. Although a cause for this behavior is unknown, and may not be related to operation of the Wells Hydroelectric Project, the PUD will continue to investigate the adult migration through the Wells Hydroelectric Project reservoir. No other actions to further improve survival appear to be feasible during the interim period.

9.2.8 Effects of the Wells Hydroelectric Project Operations on Water Quality

Due to the efficiency of the surface bypass system, large volumes of spill are typically not required to bypass juvenile UCR steelhead . This likely reduces the incidence of adult fallback and of high TDG and GBT levels. The PUD will monitor adult UCR steelhead for signs of GBT and will continue to monitor TDG in the project forebay and tailrace. They are also proposing to investigate methods for reducing TDG under high river flow conditions. No other actions to further improve survival appear to be feasible during the interim period.

9.2.9 Effects of the Wells Hydroelectric Project Predator Control Measures

The predator control methodologies employed at the Wells Hydroelectric Project have not adversely affected UCR steelhead and only minimal effects have been noted at the downstream projects employing similar methodologies. The harassment and removal programs have been successful at reducing the number of piscivorus and avian predators. No other actions to further improve survival appear to be feasible during the interim period.

9.3 Conclusions for MCR Steelhead

After reviewing the current status of MCR steelhead, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is NMFS' biological opinion that the proposed operation of the FERC-licensed Wells Hydroelectric Project is not likely to jeopardize the continued existence of this species and that there is adequate potential for recovery through April 1, 2002. Impacts to MCR steelhead that result from operation of the Wells Hydroelectric Project are likely limited to the effects of water quality, quantity and seasonal discharge rates on spawning and rearing habitats below the Yakama River. Little information is available regarding the impacts from power peaking, TDG or water temperature on this population. However, the proposed actions that address TDG will benefit MCR steelhead. In addition, effects of the Wells Hydroelectric Project operations on species-level biological requirements may be masked by operation of the downstream projects, thereby having little effect on this species. The PUD will, however, participate in any appropriate evaluations that are necessary to address impacts from the Wells Hydroelectric Project operations on MCR steelhead.

10. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA provided that such taking is in compliance with the terms and conditions of the Incidental Take Statement.

The action proposed by FERC to allow the continued operation of the Wells Hydroelectric Project through April 1, 2002, has included measures to minimize the incidental take of UCR spring-run chinook salmon and steelhead. The estimated mortality rate for juvenile UCR spring-run chinook salmon passing the Wells Hydroelectric Project was estimated in 1998 between 0% and 23% and the estimated mortality rate for juvenile UCR steelhead was estimated in 1999 between 0% and 11%.

The estimated mortality for upstream-migrating adult UCR steelhead and for adult UCR spring-run chinook through the five FERC-licensed mainstem Columbia River projects is between 11.1% and 22.2%. This estimate is based on a radio-telemetry study and represents the unaccounted loss of radio-tagged spring-run chinook salmon through the Mid-Columbia River reach (refer to Section 6.2.3). Survival at each dam must not exceed the fifth root of the survival levels estimated through the five-project reach. Therefore, the incidental take at the Wells Hydroelectric Project shall not exceed 2.2% to 4.5% of the known population during the interim period.

The mortality of downstream-migrating UCR steelhead adults (kelts) resulting from operation of the five FERC-licensed projects is unknown. Although the proportion of repeat-spawning steelhead is

considered low (NMFS 1998) their relative contribution to successive populations is also unknown. Pending development of kelt passage and survival information as described in 10.1.3, measures taken to address juvenile and adult UCR steelhead passage and survival are expected to benefit this life stage as well, and the resulting mortality, if any, is not expected to affect our conclusions during this interim period.

Affects of the Wells Hydroelectric Project on MCR steelhead are likely minimal (Section 9.3). Measures taken at the project to address water quality are also expected to benefit this species. Therefore, pending the development of additional information as discussed in Section 11 (Conservation Recommendations), the mortality of MCR steelhead, if any, is not expected to affect our conclusions during this interim period.

In the accompanying Biological Opinion, NMFS has determined that the projected levels of survival through April 1, 2002, are not likely to result in jeopardy to listed UCR spring-run chinook salmon and steelhead or to MCR steelhead. If during the course of the action these levels of incidental take are exceeded, such additional incidental take represents new information requiring reinitiation of consultation and review of the terms and conditions. The FERC must immediately provide an explanation for the causes of the taking and review with NMFS the need for possible modification of the reasonable and prudent measures.

10.1 Reasonable and Prudent Measures and Terms and Conditions for the Wells Hydroelectric Project

The NMFS believes the following reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize the impacts of incidental take associated with the proposed actions at the Wells Hydroelectric Project. In order to be exempt from the prohibitions of Section 9 of the ESA, FERC and the PUD must comply with all of these reasonable and prudent measures and terms and conditions. If implementation is delayed or deferred, NMFS shall then determine whether further consultation is required. This Incidental Take Statement may be modified as a result of this determination and the terms and conditions may subsequently be modified.

10.1.1 Monitoring Requirements

- The FERC shall require the licensee to report the number of steelhead kelts bypassing the project and the condition noted where possible to NMFS, Hydro Program, Portland, Oregon, no later than November 1 of each year. The number of kelt mortalities, and any corrective actions taken, shall be reported to NMFS, Hydro Program, Portland, Oregon, within two days of the incident. NMFS anticipates that kelt information can be collected during routine project operations and maintenance activities, including turbine and fishway dewaterings, and during operation of the adult traps.

- The FERC shall require the licensee to report the number of UCR spring-run chinook salmon and steelhead taken incidentally to the predator removal programs to NMFS, Hydro Program, Portland, Oregon, via the Wells Coordinating Committee by November 1 of each year. The number of UCR spring-run chinook salmon and steelhead mortalities resulting from the predator removal program shall be reported to NMFS, Hydro Program, Portland, Oregon, within two days of the incident. No mortalities are anticipated from these efforts at the Wells Hydroelectric Project.
- The FERC shall require the licensee to report all observations of UCR spring-run chinook salmon and steelhead mortalities (including kelts) to NMFS, Hydro Program, Portland, Oregon, within two days of the incident, and shall include a concise description of the causative event, if known and a description of the corrective actions taken at the facility.
- The FERC shall require the licensee to control TDG levels at the Wells Hydroelectric Project to less than 120% of saturation up to the seven day ten year maximum flow event based on a 115% TDG reading in the project forebay. The FERC shall require the licensee to coordinate these efforts with similar efforts required by the Washington Department of Ecology and shall require the licensee to ensure that they do not prevent attaining Clean Water Act standards that stipulate a maximum of 110% total dissolved gas. An assessment of how TDG is distributed downstream of the Wells Hydroelectric Project during high flow and spill events should also be developed.
- The FERC shall require the licensee to count adult fish as they migrate through each fishway at the Wells Hydroelectric Project and make the information available for review on a daily basis.

10.1.2 Research Reporting Requirements

- The FERC shall require the licensee to submit status reports of the research studies to the NMFS Hydro Program, Portland, Oregon, via the Wells Coordinating Committee on not less than a monthly basis throughout the duration of the study. Draft and final reports shall be submitted by December 1 and March 1 following completion of the study, respectively, or as approved by NMFS Hydro Program, Portland, Oregon.
- The FERC shall require the licensee to submit status reports of the juvenile monitoring studies, including preliminary results of the proposed juvenile reach survival studies, to the NMFS Hydro Program, Portland, Oregon, via the Wells Coordinating Committee by December 1 annually. The final report will be submitted to NMFS no later than March 1 of the year following completion of the study or as approved by NMFS Hydro Program, Portland, Oregon.
- The FERC shall require the licensee to submit status reports of the adult monitoring studies, including preliminary results of the proposed adult fishway survival and timing studies, to the NMFS Hydro Program, Portland, Oregon, via the Coordinating Committee by December 1 annually. The final report will be submitted to NMFS no

later than March 1 of the year following completion of the study or as approved by NMFS Hydro Program, Portland, Oregon.

- The FERC shall require the licensee to report the numbers of UCR spring-run chinook salmon and steelhead collected during fyke netting to NMFS, Hydro Program, Portland, Oregon, via the Wells Coordinating Committee by November 1 of each year. No more than 10 yearling UCR steelhead and 75 yearling UCR spring-run chinook salmon should be taken as a result of this monitoring effort.

10.1.3 Kelt Survival Estimation

The FERC shall require the licensee to determine the feasibility of conducting kelt survival studies. As described in Section 6.2.3., the mortality of kelts passing through the FERC-licensed projects is unknown. Once this information is developed, NMFS can establish a more appropriate numerical level of incidental take for kelts and a better method of monitoring that incidental take.

- The FERC shall require the licensee to determine the feasibility of evaluating the dam passage rate and success of downstream migrating adult steelhead (kelts) by no later than October 1, 2000. The study should include, at a minimum, late season monitoring (approximately through June) of adult radio-tagged steelhead to more precisely estimate the number and success of kelts migrating downstream through the hydrosystem.
- The FERC shall require the licensee to obtain NMFS concurrence and to implement the study, if feasible, beginning with the 2001 migration season.
- The FERC shall require the licensee to submit the status of the study and preliminary results as required by the NMFS Hydro Program, Portland, Oregon. The annual reports will be submitted to NMFS no later than March 1 or as agreed to by NMFS.

10.1.4 Operation of the Adult Trapping Facilities

The FERC shall require the licensee to discontinue use of the adult trapping facilities when water temperatures in the fishladders exceed 69º. In addition, FERC shall require the licensee to limit trap operations to a maximum of 16 hours per day for three days per week or as approved by NMFS Hydro Program, Portland, Oregon. In addition, due to increased handling and delay, the FERC shall require the licensee to discontinue passive trapping operations prior to the 2001 adult fish passage season.

10.1.5 Annual Fish Passage Plan Updates

The FERC shall require the licensee to provide an updated Fish Passage Plan to the NMFS Hydro Program, Portland, OR by December 31 each year. Following NMFS review and approval, actions in the new Fish Passage Plans should be implemented by March 1 of the following year.

11. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to minimize or avoid adverse modification of critical habitat, to help implement recovery plans, or to develop information.

11.1 To evaluate the full range of adult UCR spring-run chinook salmon and steelhead passage issues, the PUD should conduct radio-telemetry evaluations that encompass a complete range of annual river discharges as determined necessary by NMFS following modifications or improvements to project fishways. These evaluations may take at least three years in order to evaluate the facilities during low, medium and high runoff years.

11.2 In order to determine whether interim actions support the continued existence of the species over the long-term, the PUD with NMFS participation and approval, should ensure that survival evaluations are conducted for both juvenile and adult UCR spring-run chinook salmon and steelhead using the best available technology. The NMFS supports the use of radio-telemetry methodologies for evaluating adult system survival during the interim period. As better methodologies become available, the PUD should update this information with more precise estimates of adult survival.

11.3 The PUD in coordination with NMFS should ensure that adult PIT-tag detection devices are developed for the Wells Hydroelectric Project by April 1, 2002. Adult PIT-tag detectors have been developed for specific fishladders with 18-inch and 24-inch orifices and will be field tested in 2001. Any additional development work necessary for implementation at the Wells Hydroelectric Project should be completed by April 1, 2002. Information from the adult PIT-tag detectors can assist in determining inter-dam loss. Implementation should be planned in concert with NMFS and based on ongoing and future activities proposed in the basin.

11.4 The PUD should participate in regional efforts to develop methodologies for evaluating the effects of passage through multiple dam systems on the fecundity, spawning success and survival of adult salmonids when requested by NMFS. The PUD should then utilize these methodologies to help determine system effects on listed salmonids.

12. REINITIATION OF CONSULTATION

This concludes formal consultation on the interim actions proposed by FERC and the Douglas County PUD. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and: (1) If the amount or extent of incidental take is exceeded; (2) if new information reveals

effects of the agency action may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion; (3) if the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; (4) if a new species is listed or critical habitat is designated that may be affected by the action; or (5) by no later than April 1, 2002.

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